

# **FIVE-YEAR REVIEW REPORT**

**Second Five-Year Review  
for  
Logistics Center  
Fort Lewis**

**Pierce County, Washington**

**Final Report  
September 2002**

**PREPARED BY:**



**US Army Corps  
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**U.S. Department of Army  
Fort Lewis Department of Public Works  
Fort Lewis, WA**

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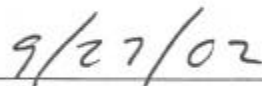
**Final Report  
September 2002**

Approved by:

  
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RICHARD L. CONTE  
COLONEL, U.S. ARMY  
DEPARTMENT OF PUBLIC WORKS  
\_\_\_\_\_

Date:

  
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

1200 Sixth Avenue  
Seattle, WA 98101

September 30, 2002

Reply To

Attn Of: ECL-117

**MEMORANDUM**

SUBJECT: Fort Lewis Logistics Center Five-Year Review

FROM: Michael F. Gearheard, Director  
Environmental Cleanup Office

TO: Fort Lewis Logistics Center Site Files

The Environmental Protection Agency (EPA) Region 10 has reviewed the Five-Year Review Report for the Logistics Center at Fort Lewis, Washington, dated September 19, 2002. The report was prepared by the U.S. Army Corps of Engineers for Fort Lewis. EPA has reviewed the report for technical adequacy, accuracy, and consistency with EPA guidance. EPA's conclusions are based primarily on the information presented in this report.

EPA concurs with the report findings, with one exception, EPA believes that an Explanation of Significant Difference (ESD) is needed to enhance the institutional control requirements in the Record of Decision to ensure long-term protectiveness for those areas that have not been cleaned up to levels that allow unlimited use and unlimited exposure. These areas include the East Gate Disposal Yard and areas containing groundwater greater than cleanup levels, both on and off the base. The need for, and the contents of, such an ESD are stated in the Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities, May 3, 1999. EPA believes that such an ESD should be completed no later than December 31, 2003.

Approved by:

Michael F. Gearheard, Director  
Environmental Cleanup Office  
U.S. Environmental Protection Agency-Region 10

30 Sept 2002  
Date

# Five-Year Review Report

## Table of Contents

List of Acronyms .....	iii
Executive Summary .....	v
Five-Year Review Summary Form .....	vii
I. Introduction.....	1
II. Site Chronology .....	3
III. Background .....	4
Site Location and Description.....	4
History.....	4
Contaminants of Concern.....	5
Land Use/Groundwater Resource Use .....	5
IV. Remedial Actions .....	6
REMEDIAL ACTION OBJECTIVE .....	6
REMEDIAL ACTION IMPLEMENTATION .....	7
REMEDIAL ACTION MONITORING .....	12
OPERATION & MAINTENANCE .....	12
V. Progress Since the Last Review .....	14
Additional Progress.....	15
VI. Five-Year Review Process.....	16
Document Review.....	17
Data Review .....	17
VII. Technical Assessment .....	20
Question A: Is the remedy functioning as intended by the decision documents? .....	20
Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid? .....	21
Question C: Has any other information come to light that could call into question the protectiveness of the remedy?.....	23
Technical Assessment Summary .....	24
VIII. Issues .....	24
IX. Recommendations and Follow-up Actions .....	25
X. Protectiveness Statement.....	26
XI. Next Review.....	27
References .....	28

## **Attachments**

Attachment 1 – Site Location Map  
Attachment 2 – Vashon Aquifer TCE Plume Map  
Attachment 3 – Vashon Aquifer TCE Plume Map – EGDY Inset  
Attachment 4 – Sea Level Aquifer TCE Plume Map  
Attachment 5 – Vashon Aquifer Water Table Contour Map  
Attachment 6 – Sea Level Aquifer Potentiometric Surface Contour Map  
Attachment 7 – East Gate Disposal Yard Defined NAPL Areas

## **Tables**

Table 1 – Chronology of Site Events [Embedded in Text]  
Table 2 – Groundwater Treatment System Performance Data Summary  
Table 3 – Annual System O&M Costs [Embedded in Text]  
Table 4 – Recommendations of the Last Five-Year Review [Embedded in Text]  
Table 5 – Pre-Startup and Quarterly Sampling Results for TCE at MWs  
Table 6 – Pre-Startup and Quarterly Sampling Results for cis-1,2-DCE at MWs  
Table 7 – Pre-Startup and Quarterly Sampling Results for 1,1,1-TCA at MWs  
Table 8 – Pre-Startup and Quarterly Sampling Results for PCE at MWs  
Table 9 – Pre-Startup and Quarterly Sampling Results for VC at MWs  
Table 10 – Extraction Well Sampling Results for TCE  
Table 11 – Extraction Well Sampling Results for cis-1,2-DCE  
Table 12 – Extraction Well Sampling Results for 1,1,1-TCA  
Table 13 – Extraction Well Sampling Results for PCE  
Table 14 – Extraction Well Sampling Results for VC  
Table 15 – Sampling Schedule Summary  
Table 16 – Outstanding Issues [Embedded in Text]  
Table 17 – Recommendations and Follow-Up Actions [Embedded in Text]

## **Appendices**

Appendix 1 – Graphical Summaries of TCE Concentrations Over Time  
Appendix 2 – Response to Reviewer Comments

## List of Acronyms

AE	Architect-Engineering Firm
ARAR	Applicable and/or Relevant and Appropriate Requirement
AS	Air Sparging
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CPTC	Clover Park Technical College (Ft. Lewis Campus)
DCE	Dichloroethene
DNAPL	Dense Non-aqueous Phase Liquid
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EGDY	East Gate Disposal Yard
ESD	Explanation of Significant Difference
ESI	Expanded Site Investigation
EW	Extraction Well
FFA	Federal Facilities Agreement
gpm	Gallons per Minute
GTS	Groundwater Treatment System
GW	Groundwater
I-5	Interstate 5
IRP	Installation Restoration Program
ISRM	In-Situ Redox Manipulation
LIF	Laser-induced Fluorescence
LNAPL	Light Non-aqueous Phase Liquid
LTM	Long-Term Monitoring
MAMC	Madigan Army Medical Center
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MIP	Membrane Interface Probe
MW	Monitoring Well
NAPL	Non-aqueous Phase Liquid
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
PNNL	Pacific Northwest National Laboratory
RA	Remedial Action
RAM	Remedial Action Monitoring
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation

ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SCAPS	Site Characterization and Penetrometer System
SOW	Scope of Work
SVE	Soil Vapor Extraction
SW	Southwest
TBC	To Be Considered
TCA	Trichloroethane
TCE	Trichloroethylene
TOC	Top of Casing
ug/l	Micrograms per Liter
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WA	Washington

## Executive Summary

The Record of Decision (ROD) for the Fort Lewis Logistics Center site, located in Pierce County, Washington, was signed in September 1990. A pump-and-treat groundwater extraction system was chosen as the best alternative remedy for meeting the established remedial action objectives for the site. The remedy also included institutional controls to prevent exposure to contaminants in the short-term and a remedial action monitoring program to assess system performance over time. The groundwater pump-and-treat system was installed in March 1995 and has been in operation since August 1995. The ROD also required additional investigations into contamination of the Sea Level aquifer and installation of a groundwater extraction system in the Sea Level aquifer if contamination exceeding maximum contaminant levels was confirmed.

After a Sea Level aquifer study was conducted and a permeable window between the Vashon and Sea Level aquifers was discovered that is suspected in allowing TCE contamination in excess of 5 micrograms per liter to contaminate the Sea Level aquifer, an Explanation of Significant Difference (ESD) to the ROD was signed in October 1998. The ESD stated innovative technologies would be used to expedite cleanup of the Logistics Center site, in particular the East Gate Disposal Yard (EGDY) source area, and that additional studies of the Sea Level aquifer were to be conducted.

Five-year review reporting was required for the Logistics Center site because implementation of the selected remedial action resulted in hazardous substances remaining on-site in the groundwater and in soils above health-based levels. The trigger for the five-year review process was the actual start of remedial action construction in May 1992. The first five-year review was completed in September 1997.

Overall, the groundwater extraction and treatment remedy is functioning as designed, although it has become evident that the dissolved-phase contamination will not be substantially remediated within 30 years of start-up. The overall selected remedy of pump-and-treat with aggressive source area removal/treatment is not functioning as designed because the source removal/treatment has not been fully implemented and therefore cannot be considered to be functioning. The immediate threats to human and ecological health have been addressed via groundwater extraction and treatment and implementation of institutional controls, and the remedy is expected to be protective of human health and the environment when groundwater clean up goals are achieved. Clean up goals are expected to be achieved through a combination of source area removal and in-situ treatment as well as continued operation and optimization of the groundwater extraction and treatment system. The time frame to complete the remedy is unknown at this time (although greater than 30 years) since complete source removal has not yet occurred.

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## Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Fort Lewis Logistics Center		
EPA ID (from WasteLAN): WA9214053465		
Region: 10	State: WA	City/County: Fort Lewis, Pierce County
SITE STATUS		
NPL status: <input checked="" type="checkbox"/> Final <input type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)		
Remediation status (choose all that apply): <input type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Operating <input type="checkbox"/> Complete		
Multiple OUs? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Construction completion date: ___ / ___ / 1995	
Has site been put into reuse? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
REVIEW STATUS		
Lead agency: <input type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency <u>Dept. of Army, Ft. Lewis</u>		
Author name: Mr. Rich Wilson		
Author title: IRP Program Manager	Author affiliation: Ft. Lewis Public Works	
Review period:** <u>10</u> / <u>01</u> / <u>1997</u> to <u>09</u> / <u>30</u> / <u>2002</u>		
Date(s) of site inspection: <u>NA</u> / ___ / _____		
Type of review: <input type="checkbox"/> Post-SARA <input type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion		
Review number: <input type="checkbox"/> 1 (first) <input checked="" type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify) _____		
Triggering action: <input type="checkbox"/> Actual RA Onsite Construction at OU # _____ <input type="checkbox"/> Actual RA Start at OU# _____ <input type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify)		
Triggering action date (from WasteLAN): ___ / ___ / _____		
Due date (five years after triggering action date): ___ / ___ / _____		

\* ["OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

## **Five-Year Review Summary Form, cont'd.**

### **Issues:**

It became apparent, based on improved general pump-and-treat system understanding and new site characterization data, that pump-and-treat alone would not remediate the Vashon aquifer to beneficial use within the 30-year timeframe stated within the ROD.

Most groundwater treatment system extraction wells have experienced a gradual decrease in well capacity and several wells have had documented cases in which the pump and well were biofouled. Therefore, it is suspected that the likely cause of decreased well capacity throughout the Logistics Center is due to biofouling.

The bulge in the dissolved-phase shallow TCE plume to the southwest of EGDY has been determined to be from a localized change in groundwater flow direction from the regional trend. Regional trend is to the northwest and localized flow is to the southwest.

It is currently not known whether the Sea Level aquifer contaminant plume is expanding, contracting, or is stable due to lack of sufficient historical Sea Level aquifer data. There is currently no remedy in place for the Sea Level aquifer.

EGDY source removal and treatment of NAPL should be conducted to reduce contaminant mass contributing to the dissolved-phase TCE plume.

Remedial action monitoring network optimization should be conducted to improve Logistics Center monitoring and to reduce associated long-term monitoring costs where appropriate.

The Beachcomber Complex well was discovered to be within the current downgradient Vashon aquifer TCE plume limits. Well water was analyzed for VOCs in July 2002, in particular for TCE; however, all VOCs were reported as non-detect.

Because the I-5 system may not be capturing all of the Vashon aquifer TCE plume southwest of LX-1, and because the EGDY system is expected to change after thermal treatment, the groundwater treatment system requires optimization.

### **Recommendations and Follow-up Actions:**

The ESD stated that innovative technologies and source removal would be utilized to expedite the remediation of the Vashon aquifer.

To restore extraction well production rates to designed capacities, a preventative maintenance program to combat biofouling may be warranted.

The bulge in the TCE plume to the southwest of EGDY has been characterized based on Phase II RI results and historical existing data. This area of the plume will continue to be monitored as part of the Logistics Center Remedial Action Monitoring program.

Additional wells have been installed and the Sea Level aquifer contaminant plume will continue to be monitored as part of the remedial action monitoring program to determine plume condition/stability. EGDY source treatment, continued innovative technology evaluation, and continued Sea Level aquifer evaluation will be conducted to demonstrate progress toward Sea Level aquifer remedy.

EGDY source removal and treatment of NAPL is being conducted to eliminate the dissolved-phase TCE plume source down gradient of EGDY. A source area drum removal action was completed in 2001, and an in-situ thermal treatment contract is scheduled to be awarded in late 2002.

The remedial action monitoring network will be further optimized after eight quarters of sampling under the new sampling schedule have been completed.

Groundwater extracted from the Vashon aquifer via the Beachcomber Complex well will continue to be monitored periodically to insure that the MCL for TCE is not exceeded.

The groundwater treatment system, in particular the EGDY sub-system, should be optimized once the source area thermal treatment is complete. Minor adjustments to the system could be made prior to the completion of thermal treatment to correct minor deficiencies in the system. Treatment system optimization will insure that the total operating time and cost of the system are minimized, and that the TCE plume, above 5 ug/l, is being completely captured.

With regard to institutional controls at the Logistics Center site, Fort Lewis will continue to research, discuss, and employ the guidance provided by Office of the Under Secretary of Defense memorandum, "Army Implementation of Defense Guidance on Land Use Control Agreements with Environmental Regulatory Agencies," dated 19 March 2001. In addition, and concurrent with this guidance, Fort Lewis will study USEPA guidance on, "The EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities" and, where feasible and concurrent with Department of Defense guidance, implement.

**Protectiveness Statement(s):**

In the short-term, the groundwater treatment system remedy, along with institutional controls, protects human health and the environment. The optimized groundwater treatment system, along with the implementation of source area treatment, will ensure long-term protectiveness of human health and the environment.

**Other Comments:**

None

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# Five-Year Review Report

## I. Introduction

The purpose of this five-year review is to determine whether the remedy at the Fort Lewis Logistics Center as stated in the ROD and as revised in the ESD has remained protective of human health and the environment. The remedy included Vashon aquifer (upper aquifer) groundwater extraction, treatment, reinfiltration, and monitoring along with administrative and institutional controls, investigation of the Sea Level aquifer (lower aquifer), and source area soil identification and characterization. The major components of the enhanced remedy in the ESD included further source area investigation, further Vashon and Sea Level aquifer plume characterization, innovative technologies investigation and evaluation, and conductance of additional studies on the transport of contaminants to and through the Sea Level aquifer. The methods, findings, and conclusions of the review are documented in this Five-Year Review report. In addition, Five-Year Review reports identify issues found during the review and recommendations to address them.

This five-year review is being prepared pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The U.S. Environmental Protection Agency (USEPA) interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Army Corps of Engineers (USACE), Seattle District has conducted a five-year review of the remedial actions implemented at the Fort Lewis Logistics Center on behalf of the lead agency, the Fort Lewis Department of Public Works. This review covers the inclusive dates of October 1997 to September 2002. This

report documents the results of the review. Reports pertinent to this five-year review are listed in the references section of the report. URS Corporation was the primary architect-engineering (AE) contractor providing long-term monitoring (LTM) and operation and maintenance (O&M) support, while Gary Struthers Associates (GSA) provided environmental restoration services related to source area drum removal to the USACE and Fort Lewis Department of Public Works during this review period.

This is the second five-year review for the Fort Lewis Logistics Center site. The triggering action for the first five-year review was the beginning of construction on Phase 1 of the Remedial Action in May 1992, as shown in USEPA's WasteLAN database. Phase 1 of the Remedial Action was the design and installation of East Gate Disposal Yard and I-5 extraction wells, recharge wells, observation wells, monitoring wells, pumping/infiltration testing of the extraction and recharge wells, and chemical sampling of all aforementioned wells for volatile organic compounds (VOCs). Phase 2 RA construction consisted of the installation of the groundwater treatment systems and extraction well hook-ups to these systems.

The first five-year review report (USEPA 1997) was finalized in September 1997. The first five-year review report was published prior to the revision in five-year review report formatting (USEPA 2001) and therefore did not follow the same format as required for this report. The first five-year review report contained the following sections: (I) Introduction, (II) Remedial Objectives, Areas of Noncompliance, (III) Recommendations, (IV) Statement on Protectiveness, and (V) Next Review.

The condition triggering the five-year review process was the presence of contaminants above clean up levels in groundwater remaining in both shallow and deep groundwater at the Logistics Center site, as well as EGDY soils. These contaminants and their respective clean up levels for groundwater are: Trichloroethylene (TCE) in excess of 5 micrograms per liter (ug/l), cis-1,2-dichloroethene (DCE) in excess of 70 ug/l, 1,1,1-trichloroethane (TCA) in excess of 200 ug/l, tetrachloroethylene (PCE) in excess of 5 ug/l, and vinyl chloride (VC) in excess of 2 ug/l. Additionally, complete source removal of TCE non-aqueous phase liquid (NAPL) at the East Gate Disposal Yard source area has not occurred to date. Both of these conditions prevent unlimited use and unrestricted exposure.

A brief discussion is provided for the other two areas of Fort Lewis requiring five-year reviews. The two other areas are Landfill 4 and the Illicit PCB Dump Site. The approach to separate out the Logistics Center review from the others is due to the high degree of complexity and large volume of data for the Logistics Center site. The remedial action for Landfill 4 included soil vapor extraction and air sparging (SVE/AS). The SVE/AS system was in operation for a total of three years. Rebound of contaminant concentrations in groundwater occurred a short time after system shutdown. Currently groundwater monitoring is being conducted on an annual basis for the two monitoring wells closest to Sequelitchew Springs. Monitored natural attenuation is being considered as a follow up to the remedial action for Landfill 4, although additional characterization is required prior to a rendered decision for the site. A removal action occurred and a clay

cap and perimeter fencing has been constructed as the remedy for the Illicit PCB Dump site. Clay cap maintenance (mowing), visual inspection, and perimeter fence inspection is being performed annually to semiannually. No problems have been encountered regarding the performance or maintenance of the clay cap. Additionally, groundwater monitoring at the Illicit PCB Dump site is being conducted. The Solvent Refined Coal Pilot Project operable unit at Fort Lewis has been successfully cleaned up to treatment standards and requires no five-year review.

## II. Site Chronology

The following table (**Table 1**) provides a chronological summary of site events that have occurred at the Fort Lewis Logistics Center.

**Table 1: Chronology of Site Events**

Event	Date
Army identified traces of TCE in several monitoring wells installed in the shallow, upper aquifer beneath the Logistics Center	1985
Limited site investigation was performed under Department of Defense (DoD) Installation Restoration Program (IRP)	1986
NPL listing of Logistics Center site	1989
Remedial Investigation/Feasibility Study (RI/FS) in accordance with CERCLA completed	1990
Ft. Lewis installation-wide Federal Facilities Agreement (FFA) signed by Ft. Lewis, USEPA, and Washington Department of Ecology (Ecology)	1990
CERCLA Record of Decision (ROD) signed, specifying that a pump-and-treat system be installed to restore groundwater to beneficial use as drinking water source	1990
Construction for Remedial Action Groundwater Treatment System (GTS) begins, triggering five-year review process for Logistics Center site	1992
Logistics Center Sea Level aquifer study completed	1995
Remedial Action GTS began operation	1995
First Five-Year Review Report for Logistics Center	1997
Two-Year Performance Evaluation Report for GTS and RA Report completed	1998
Explanation of Significant Difference (ESD)	1998
Expanded Site Investigation conducted to determine if NAPL is present in EGDY as a source to the Logistics Center TCE plume	1998-2000
EGDY source area drum removal action conducted	2000-2001
Engineering Evaluation/Cost Analysis (EE/CA) for EGDY and Logistics Center completed	2001
Draft Logistics Center Remedial Action Monitoring (RAM) Network Optimization Report completed	2001
EGDY/Logistics Center Phase 2 RI conducted	2001-2002
EGDY/Logistics Center Draft Risk Assessment Addendum completed	2001

**Table 1: Chronology of Site Events**

Event	Date
Remedial design (EGDY In-Situ Thermal Remediation) start	2003 (Projected)

### III. Background

#### SITE LOCATION AND DESCRIPTION

The Fort Lewis Logistics Center is located on the Fort Lewis Military Reservation (Fort Lewis) in Pierce County, Washington (**Attachment 1**). Fort Lewis is located along Interstate 5 (I-5), approximately 11 miles southwest of Tacoma and 17 miles northeast of Olympia. The total land area of Fort Lewis is approximately 86,000 acres. The Logistics Center occupies approximately 650 acres, or 0.8 %, of the total area occupied by Fort Lewis. The Logistics Center is bounded to the Northwest by I-5 and the town of Tillicum, to the north by the American Lake Gardens Tract, to the east by outlying areas of the Fort Lewis installation, and to the southwest by Madigan Army Medical Center (MAMC).

#### HISTORY

Fort Lewis was established in 1917 and has been in continuous use since that time. The initial development of the Logistics Center began in 1941 with construction of the Fort Lewis Quartermaster Motor Base. In August 1942, the facility was transferred to ordnance jurisdiction and renamed the Mount Rainier Ordnance Depot, which operated until 1963. In 1963 the facility became the Logistics Center to serve as the primary non-aircraft maintenance facility for the post. Trichloroethylene (TCE) was used historically at the Logistics Center in large quantities as a degreasing agent until the mid-1970s when its use was replaced by trichloroethane (TCA). Waste TCE was disposed with waste petroleum, oils, and lubricants at the East Gate Disposal Yard (EGDY, also historically called Landfill 2), located at the southeastern edge of the Logistics Center (**Attachment 1**).

The Fort Lewis Logistics Center was included on the National Priorities List (NPL) in December 1989, under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). An installation-wide Federal Facilities Agreement between the U.S. Army, the USEPA, and Ecology became effective January 29, 1990. The agreement established the procedural framework for agency coordination, and a schedule for all CERCLA and Resource Conservation and Recovery Act (RCRA) corrective activities at Fort Lewis. In support of Fort Lewis, USACE conducted the Remedial Investigation/Feasibility Study. The Record of Decision (ROD) for the Logistics Center Operable Unit selected groundwater extraction and treatment as the remedy for groundwater cleanup. The USACE performed the Remedial Design (RD), and in compliance with the ROD, the groundwater treatment project included the

installation of two pump-and-treat facilities (EGDY and I-5 systems) at the Logistics Center. The USACE managed the remedial system construction and is currently managing the Remedial Action (RA) monitoring and the O&M contract.

## **CONTAMINANTS OF CONCERN**

TCE has been identified as the major contaminant beneath the Logistics Center based on its widespread detection in groundwater monitoring wells across the site. The release of TCE was primarily from on-site disposal in the non-aqueous phase at the EGDY. The TCE and other hydrocarbon contaminants leached from the disposal trenches at the EGDY down to the shallow, unconfined Vashon aquifer where they dissolved and were subsequently transported down gradient with the advective movement of the groundwater.

TCE in the dissolved phase has been detected in the Vashon aquifer at concentrations as high as 250,000 ug/l and in the Sea Level aquifer as high as 180 ug/l. In the Vashon aquifer, the TCE plume trends southeast to northwest across the Logistics Center with a total length of approximately 13,000 feet and a width of approximately 4,000 feet (**Attachments 2 and 3**). The Vashon aquifer TCE plume begins at the EGDY and ends approximately 2,500 feet northwest of the I-5 extraction well field. Beyond Washington Avenue in Tillicum, an older, smaller lobe of the TCE plume has separated from the main plume component and is believed to be entering American Lake and is subsequently being diluted to negligible (i.e., undetectable) levels. The Sea Level aquifer TCE plume is centered approximately 400 feet upgradient of South I Street in the vicinity of wells LC-41D and LC-69D and extends primarily to the northwest and west approximately 4,800 feet downgradient (**Attachment 4**). Groundwater flow direction in the Vashon aquifer is regionally to the northwest (**Attachment 5**) and is to the west-northwest in the Sea Level aquifer (**Attachment 6**). All maps depicting TCE concentrations and groundwater elevations included in this report were developed from March 2002 data, the last round in which a complete set of analytical results are available.

Other volatile organic compounds (VOCs) detected in groundwater beneath the Logistics Center include DCE, PCE, TCA, and VC. Since TCE is by far the most prevalent contaminant of concern, TCE is discussed in more detail in subsequent sections of this report. The remedy in the ROD was designed to remediate VOCs only. However, lead was also included as a contaminant of concern due to activities associated with the Battery Acid Pit.

## **LAND USE/GROUNDWATER RESOURCE USE**

Former and current land use at the Logistics Center proper is primarily industrial. The Logistics Center specifically consists of a complex of warehouses, motor pools, maintenance facilities, and an equipment disposal yard area. Small residential communities exist nearby, with the Evergreen and Madigan Family Housing developments at Fort Lewis to the west-northwest and southwest of the Logistics Center,

respectively, and the town of Tillicum to the northwest. The American Lake Gardens Tract is another small residential development to the north of the Logistics Center. Projected land use is identical to the former and current land use as described above since the Logistics Center will continue to provide required maintenance and supply activities to support troop activities in the foreseeable future.

The Vashon aquifer is currently used as a source of drinking water by the Lakewood Water District, Fort Lewis, Dupont Water System, and private residences (URS 2001b). However, no known water supply wells screened in the Vashon aquifer, with the exception of a well known as the Beachcomber Complex well, are located within the current boundaries of the upper aquifer contaminant plume. A private water supply well called the Beachcomber Complex well, located in Tillicum just south of the southern shore of American Lake, is within the general area of the separate lobe of low-level TCE ( $5 < \text{ug/l} < 10$ ) described earlier in Section III (Background, Contaminants of Concern) of this report. The Beachcomber well was tested for VOCs in July 2002; however, and no VOCs, including TCE, were detected. No known future Vashon aquifer supply wells are slated to tap the upper aquifer in the vicinity of the Logistics Center.

The Sea Level aquifer is also currently used as a source of drinking water by the Lakewood Water District, Fort Lewis, Dupont Water System, the Town of Steilacoom, and private residences (URS 2001b). Additionally, the MAMC uses the Sea Level aquifer to supply water to their cooling system and as an emergency backup water supply (U.S. Army, Fort Lewis Public Works 1996). The only Sea Level aquifer wells that are within the contaminant plume (although outside the 5 ug/l contour) that are currently being used are the two MAMC wells. One of these wells (MAMC 3) supplies water to the cooling system and is not used as a domestic water supply. The highest TCE concentration detected at well MAMC 3 thus far has been 2.7 ug/l, below the MCL of 5 ug/l. The other well (MAMC 4) could potentially be used for drinking water if the MAMC lost its main water supply; however, no contamination has been detected in this emergency water supply well. Fort Lewis recently shut down base water supply well PS Well 13 screened in the Sea Level aquifer near the plumes southwestern edge when it started to show detections of TCE. There was some speculation that operating PS Well 13 and MAMC wells had pulled the plume in that direction. A map depicting both Sea Level and Vashon aquifer water supply wells within the TCE plume vicinity is included as Figure 2-6 in the Draft Risk Assessment Addendum (URS 2001b). No known future Sea Level aquifer supply wells are slated to tap the Sea Level aquifer in the vicinity of the Logistics Center

## **IV. Remedial Actions**

### **REMEDIAL ACTION OBJECTIVE**

The remedial action objective, or goal, for the Logistics Center site is to restore groundwater to its beneficial use, which at this site, is a drinking water source.

The components of the remedy in order to achieve this goal, as stated in the ROD,

are:

- To install groundwater extraction wells capable of capturing the groundwater contaminant plume in the Vashon aquifer,
- To install on-site groundwater treatment facilities to remove contaminants from the collected groundwater,
- To expedite groundwater remediation, install groundwater extraction wells near areas of highest concentration of contamination and discharge treated groundwater up gradient of these extraction wells to facilitate flushing secondary sources from the groundwater,
- To monitor the groundwater contaminant plume and the extraction/treatment system during groundwater remediation activities to ensure that both groundwater and surface water remediation goals are achieved.
- To implement administrative and institutional controls that supplement engineering controls and minimize exposure to releases of hazardous substances during remediation,
- To investigate the Sea Level aquifer to determine the presence of contamination and to evaluate the extent of contamination, if necessary, and
- To perform confirmation soil sampling to ensure that all remaining sources of soil contamination have been identified and characterized.

Additional components of the remedy, as stated in the ESD, are:

- To utilize innovative technologies to accelerate treatment and/or control the source area and contaminant plume in the Vashon aquifer in addition to utilization of groundwater extraction and treatment in on-site treatment facilities, and
- To conduct additional studies on the transport of contaminants to and through the Sea Level aquifer.

## **REMEDIAL ACTION IMPLEMENTATION**

The selected remedial action (RA) remedy included extraction, treatment, and recharge of the upper aquifer groundwater beneath the Logistics Center. Two well fields, 2 treatment plants, and 2 recharge systems have been constructed – one system to the east of Interstate 5 and one at the EGDY. Design and construction of the GTS began in 1992 and the system was operational by August 1995. An objective of the remediation was to restore the Vashon aquifer to drinking water standards by reducing the concentration of the primary contaminant of concern (TCE) to less than 5 ug/l within 30 years.

One GTS is located at each end of the Logistics Center: the I-5 system was designed to halt further flow of contaminated groundwater across the installation boundaries past I-5 and toward the town of Tillicum, while the East Gate system is removing contaminants directly from the source area. The I-5 well field contains 15 extraction wells (LX-1 through LX-15) located along a line from 150th Avenue to the south end of Tacoma Drive. Four infiltration galleries located immediately southeast of I-5 receive the treated groundwater effluent from the air stripper located between the

extraction wells and infiltration galleries. All infiltration galleries discharge to the shallow, upper Vashon aquifer. The I-5 well field was designed to operate at 2,000 gpm.

The East Gate well field is divided into primary and secondary extraction fields and a recharge field. The primary well field consists of extraction wells LX-17, LX-18, LX-19, and LX-21, located near the intersection of Rainier Drive and East Lincoln Drive. The secondary well field consists of extraction wells LX-16 and RW-1, located 1,500 feet down gradient of the primary extraction field. The recharge field contains two recharge wells, LR-1 and LR-2, and two infiltration galleries located approximately 1,000 feet up gradient of the primary well field. Both infiltration galleries discharge to the upper Vashon aquifer, while both recharge wells discharge to the lower Vashon aquifer. All East Gate groundwater influent is treated in an air stripper tower located adjacent to the primary East Gate well field. The East Gate well field is designed to operate at 800 gpm.

In general the infiltration galleries (and recharge wells) have been successful in accepting all pumped and treated groundwater to the subsurface. The head differential produced between the natural water table and mounded groundwater due to infiltration appears to be relatively small, hence the increase in groundwater flow velocity and the flushing potential of contaminants may not be as great as expected during design. Additionally, the flow direction through the southeastern most portion of the EGDY in the upper Vashon has been determined to be to the southwest (counter to the regional northwest gradient direction) and therefore groundwater recharged at EGDY by the infiltration galleries does not aid in flushing contaminants toward the EGDY extraction wells located to the northwest. One benefit of infiltrating treated water into the lower Vashon at EGDY is a measured upward vertical hydraulic gradient in the Vashon in the vicinity of the recharge wells. This upward gradient is believed to be helping to prevent downward migration of dissolved-phase TCE at the southeastern most end of the EGDY.

Further investigation of the Sea Level aquifer conducted between 1991 and 1994 (USACE 1994; USACE 1993) found that the hydrogeology beneath the Logistics Center is complex and may allow contamination from the Vashon aquifer to migrate through permeable soil to the Sea Level aquifer below. An Explanation of Significant Difference (ESD) from the ROD was signed in 1998 (U.S. Army, USEPA, and Ecology 1998) which delayed a decision on choosing a remedy for the Sea Level aquifer until additional information on this aquifer was obtained. The changes are described below.

The 1998 ESD specified:

...using innovative technologies to accelerate treatment and/or control of the source area and the contaminant plume in the Vashon aquifer in addition to utilizing groundwater extraction and treatment in on-site treatment facilities. The extraction and treatment systems may be shut down at some time in the future if no longer required.

where the 1990 ROD had specified:

...using groundwater extraction and treatment in on-site treatment facilities.

Also, the 1998 ESD specified:

...accelerating the cleanup of the Vashon aquifer through source control at the EGDY and the use of innovative technologies in the Vashon aquifer, and conduct[ing] additional studies on the transport of contaminants to and through the Sea Level aquifer.

where the 1990 ROD had specified:

...extending the groundwater extraction and treatment in on-site treatment facilities to the Sea Level aquifer if found to be contaminated.

Between 1998 and 2000, an expanded site investigation was undertaken to determine if NAPL was present at the EGDY as a source to the Logistics Center TCE plume. Up to the time of this investigation, NAPL at the EGDY had been suspected but not confirmed. During the expanded site investigation, DNAPL and LNAPL mixtures, LNAPL, and buried drums were observed at the EGDY based on geophysical investigation and limited trenching activities. Therefore EGDY was determined to be the primary source area for the Logistics Center TCE plume. Drive point groundwater sampling was also conducted and helped determine rough extents of LNAPL and DNAPL inferred from dissolved-phase contaminant concentrations (URS 1999).

In 1998, a Remedial Action Report for the Logistics Center Operable Unit Groundwater Treatment Project was published (USACE 1998a), along with a Two Year Performance Evaluation Report for the Groundwater Treatment Project (USACE 1998b). Both reports described the design, construction, and implementation of the pump-and-treat systems of the Logistics Center. It was determined that, overall, the Fort Lewis Logistics Center GTS was functioning as designed.

A working group for the Fort Lewis Installation Restoration Program (IRP), made up of Fort Lewis public Works, USEPA, Ecology, Pacific Northwest National Lab (PNNL), and the U.S. Geological Survey (USGS), was established in November 1997. The USACE was included in the group in 2000. This group meets periodically to discuss future progress and future directions of the cleanup effort at Fort Lewis. As a result of the USACE's recommendation, and in concurrence with the regulators, source area drum removal at EGDY was initiated in December 2000 under an Emergency Response Time-Critical Removal Action dated July 24, 2000. EGDY drum removal activities were conducted January to July 2001. This action removed all buried drums (intact and crushed, RCRA-empty and non-RCRA empty) from the historical disposal areas at EGDY. NAPL that had already leaked from buried drums, or that which was placed directly into/onto the ground while the landfill was active, remains below ground at the EGDY site. A total of 784 drums and other containers that were considered non-RCRA empty (>1 inch of residue in drum/container) were removed from the EGDY. The drums,

other containers, and impacted soil removed from the site contained and estimated 46,000 pounds of TCE (GSA 2001). The estimate of 46,000 pounds of TCE removed from the EGDY in drums, containers, and associated impacted soil was based on averaging TCE concentrations from each roll off bin or drum, multiplying by mass of waste removed from that roll off bin or drum, and totaling all bins and drums to obtain TCE mass removed. As part of the drum removal action, site perimeter fencing was installed along the front of the site paralleling East Lincoln Drive, and locking gates were installed at the main entrance to the site off Rainier Avenue, and on unnamed gravel roads to the east and west of EGDY. Signage was affixed to each gate reading, "Restricted Area – Keep Out. Clean up in Progress FY2001-2005. Fort Lewis Logistics Center Superfund Site." The fencing, gates, and signage have helped to prevent unauthorized entry to the site.

Several innovative technologies have been evaluated as potential enhancements and/or replacement technologies for the current pump and treat. An evaluation of in situ redox manipulation (ISRM) was completed in FY2000 by Pacific Northwest National Laboratory (PNNL 2000). Battelle Memorial Institute and Cornell University completed field testing the reductive anaerobic biological in situ treatment technology (RABITT) protocol at the EGDY site in FY2000 (Battelle 2001). The RABITT demonstration was funded under the DoD Environmental Security Technology Certification Program (ESTCP). The RABITT laboratory and field studies revealed that dechlorination could be very effective at the EGDY site.

Ongoing innovative technology evaluation/demonstration projects scheduled to take place concurrent with the EGDY source area thermal treatment remedial action include:

1. Pacific Northwest National Laboratory will evaluate TCE dechlorination as a function of system temperature and various nutrients.
2. North Wind Environmental will conduct an ESTCP demonstration project to evaluate in situ bioremediation of chlorinated solvent source areas with enhanced mass transfer.
3. Battelle Memorial Institute will conduct an ESTCP evaluation of thermal treatment technologies to identify performance metrics that can be used to accurately assess the long-term effectiveness of these technologies. The EGDY site will be used as a demonstration site to evaluate various techniques for assessing contaminant mass flux from source areas.
4. Dr. Lewis Semprini with the Department of Civil, Construction, and Environmental Engineering Oregon State University will conduct two ESTCP projects utilizing the EGDY site. One project will evaluate the potential to use Radon-222 as a natural tracer for monitoring the remediation of NAPL contamination in the subsurface. The second project will conduct push -pull tests for evaluating the in-situ aerobic treatment of chlorinated mixtures in groundwater.

An engineering evaluation/cost analysis (EE/CA) (URS 2001a) for the EGDY and

Logistics Center at Fort Lewis was completed in 2001 and recommended in-situ thermal technologies to remediate the free-phase product present at the EGDY, and optimization of the existing groundwater pump-and-treat system to remove remaining dissolved-phase contamination. The overall treatment strategy for the site will be reevaluated following the aggressive source area treatment.

Fieldwork associated with the EGDY and Logistics Center Phase 2 Remedial Investigation (RI) was begun in July 2001 and completed in April 2002. The associated Phase 2 RI report is being written concurrently with this five-year review. Work associated with the Phase 2 RI focused on the EGDY and included a Site Characterization and Analysis Penetrometer System (SCAPS) and Geoprobe investigation using Laser Induced Fluorescence (LIF) and Membrane Interface Probe (MIP) to determine nature and extent of NAPL, limited geophysical investigation to complement knowledge of subsurface stratigraphy, soil boring and monitoring well installation using the sonic drilling technique to determine both NAPL and dissolved-phase extent/characteristics and subsurface stratigraphy, and exploratory trenching to investigate several suspected waste disposal areas located outside the EGDY. This field work was successful in ruling out all investigated potential sources contributing to the TCE contaminant plume outside of the EGDY, and was also successful in determining lateral and vertical extents of separate-phase TCE and other chlorinated and non-chlorinated hydrocarbon contaminant sources at the EGDY. The three main NAPL Areas were defined during the investigation – the horizontal extents of which are depicted in **Attachment 7**. The results of this investigation were incorporated into the EGDY In-Situ Thermal Remediation Specifications and Drawings package (URS 2002).

A Risk Assessment Addendum (URS 2001b) covering human and ecological health not previously addressed in the baseline risk assessment (completed in 1990) was published in 2001 in draft form. The addendum human health evaluation focused on soils within the EGDY, vapor intrusion into buildings from chemicals within the Vashon aquifer plume, and use of the Sea Level aquifer as a drinking water source. Risks and hazards due to indoor inhalation of vapors from the Vashon aquifer were within USEPA's acceptable risk ranges (between  $10^{-4}$  to  $10^{-6}$  and  $<1$ , respectively) for both workers and residents. Risks and hazards from domestic use of Sea Level aquifer groundwater were above the target health goals. Risks and hazards for child trespassers and construction workers at EGDY were above the target health goals.

The ecological health evaluation was a limited, focused screening level risk assessment and was performed to quantify risks for aquatic biota and piscivorous wildlife due to volatile organic compounds (VOCs) in the surface waters of Murray Creek, which runs along the southwestern edge of the Logistics Center and is believed to be hydraulically connected to EGDY and Logistics Center groundwaters. No significant ecological risks for any of the target receptors were identified for any of the detected VOCs in Murray Creek.

## **REMEDIAL ACTION MONITORING**

Six and three-quarter years of quarterly remedial action monitoring has been conducted to date, from December 1995 to June 2002. June 2002 marked the 27<sup>th</sup> quarter of monitoring activities in support of the groundwater treatment system at the Logistics Center. March 2002 data is the latest data available for inclusion into this report. Annual monitoring reports have been completed for the first five years of monitoring (URS 2001c, 2000a, 2000b, 1998, 1997). This monitoring is required to ensure that the treatment system is functioning adequately and to verify that the remedial action objectives (RAOs) are being achieved.

The remedial action monitoring program has evolved since its start-up in 1995 due to a better understanding of field conditions as well as modifications to improve sampling consistency and representativeness. This paragraph details the changes made. Beginning the 5<sup>th</sup> quarter of sampling, methodology was changed for surface water sampling from dipping a 40-ml vial into the stream to use of a glass thief tube. One surface water sample location was moved from a random location to one that intersected the shallow TCE plume effective the 11<sup>th</sup> quarter. Analytical methodology was changed from USEPA Methods 8010A and 8260 to Method 8260B effective the 12<sup>th</sup> quarter. Also beginning the 12<sup>th</sup> quarter, minor substitutions and additions of wells took place in the monitoring network. Beginning with the 15<sup>th</sup> quarter, a low-flow purging and sampling technique was implemented using non-dedicated submersible pumps. Effective the 17<sup>th</sup> quarter, dedicated bladder pumps were installed for sample collection in the Vashon aquifer wells, replacing the use of electric submersible pumps for purging and Teflon bailers for sampling. Since the 17<sup>th</sup> quarter, dedicated bladder pumps have been installed in the Sea Level aquifer wells. Beginning the 25<sup>th</sup> quarter, a significant revision to the specific wells sampled and frequency of sampling occurred. Periodically, additional monitoring wells were added to the network for water level elevations.

The Fifth Annual Monitoring Report (URS 2001c) and the Draft RAM Network Optimization Report (USACE 2001) both examine the first five-year quarterly monitoring data set (the first 20 quarters). Statistical analyses were performed to summarize and clarify the analytical data collected up to September 2000, and to determine whether changes in the RAM network would reduce data redundancy.

A draft report documenting a remedial action monitoring network optimization was published in May 2001 (USACE 2001). The goal was to maximize efficiency of the GTS monitoring network while assuring that alteration of the existing monitoring network did not adversely affect data quality or integrity. The optimization generally consisted of monitoring a greater number of monitoring wells but at a reduced frequency.

## **OPERATION & MAINTENANCE**

The majority of extraction wells in each GTS have been in nearly constant operation since startup. Short term shut down of the systems has occurred periodically

for both routine and non-scheduled maintenance. Some wells in each system have been out of operation for up to several months due to repairs being made to the pumping equipment, and some wells have been shut down for periods of time by Fort Lewis to assist with other studies being conducted at the site.

In August 1998, East Gate system extraction wells LX-16 and RW-01 were shut down by Fort Lewis to conduct the In-Situ Redox Manipulation (ISRM) Proof of Principal Test. This work was conducted by PNNL (PNNL 2000) in an area adjacent to the wells. These two wells were brought back on line in May 2001. Throughout the O&M history, several wells have been taken off line briefly to repair various pump components. Pump performance/pumping rates showed a general, gradual decline over time at nearly all wells. Well LX-13 was taken off line in June 1999 and was subsequently acid-treated and redeveloped due to biofouling. RW-01 was acid-treated and redeveloped in July 2001 due to biofouling. LX-13 and LX-18 were acid-treated and redeveloped in April 2002 due to biofouling. Due to the reduction in flow rates at most extraction wells that may be attributable to biofouling, it may become necessary in the future to implement a routine preventative maintenance program specifically aimed at reducing the impact biofouling has on the GTS. See **Table 2**, at the back of this report, for the GTS Performance Data Summary listed by sampling event.

The total estimated O&M costs associated with the GTS (including I-5 and East Gate systems) was \$135,000 per year excluding electricity costs and in 1989 dollars. This estimate was developed for the 1990 Feasibility Study Report (Ebasco 1990b). This figure also does not include costs associated with groundwater monitoring and system compliance monitoring. **Table 3**, below, shows actual annual system O&M costs. The annual cost of O&M has ranged from a low of \$160,000 to a high of \$215,000 between the years of 1997 and 2002, and has not been significantly above anticipated levels. When actual costs from 1997 to 2002 are averaged, a mean annual cost of \$177,500 is obtained. If an assumed 3% per year inflation rate is applied to the 1989 estimate of \$135,000 per year and the values between 1997 and 2002 are averaged, the total estimated average O&M cost is \$184,000, which compares favorably with the actual averaged cost.

**Table 3: Annual System O&M Costs**

<b>Year</b>	<b>Total Cost rounded to nearest \$5,000</b>
1997	\$215,000
1998	\$165,000
1999	\$175,000
2000	\$160,000
2001	\$175,000
2002	\$175,000

## V. Progress Since the Last Review

The last five-year review stated that the remedy for the site as selected in the ROD remained protective. However, based on currently available monitoring data, the shallow aquifer GTS does not appear to fully contain the upper aquifer plume at EGDY. Additionally, a small portion of the upper aquifer plume may not be captured by LX-1, the southwestern-most extraction well along the I-5 well field. These two issues will be further discussed in Sections VI through IX. The first five-year review also stated that to remain protective in the future, all components of the remedy must continue to be implemented and that the recommendations made during the last five-year review must be addressed. **Table 4** summarizes the recommendations made during the last five-year review and how these recommendations have been addressed. Institutional land use controls are discussed further, below.

**Table 4: Recommendations of the Last Five-Year Review**

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome
TCE source reduction or removal	Implement further source area study to determine if GTS can be enhanced, altered or replaced.	Ft. Lewis	November 1998 for field work of ESI	Expanded Site Invest.; source area removal action; Phase 2 RI source area investigation
ESD for Sea Level Aquifer	ESD to be completed to include Sea Level aquifer contamination reporting, reasoning for not proceeding with GTS in Sea Level aquifer at that time, and to describe alternative remedy	Ft. Lewis	N/A	ESD written & signed
Institutional controls to prevent use of contaminated Vashon aquifer groundwater	Enforceable institutional controls should be established prior to and in the event of BRAC property transfer	Ft. Lewis	N/A	Institutional controls established; Property is not to be transferred from DoD
Institutional controls to prevent use of contaminated Vashon aquifer groundwater	Annual or biannual reports on effectiveness of institutional controls requested	Ft. Lewis	N/A	N/A

Planning for Fort Lewis land use controls was strengthened in 1998 with the development of a Master Plan for base land utilization. This planning document is the basis for all current and future construction programs, use of open space, and training lands. The Master Plan allocates training lands to be managed by Fort Lewis Range

Control. Any additions or changes to training areas must be coordinated through Range Control and the Master Plan.

Engineering controls at EGDY to prevent exposure to contaminated soil during the past five years consisted of excluding the Landfill from the public by a cantonment fence and locked gates. Signage was posted stating that the site (1) was a superfund site, (2) was under remediation, and (3) only authorized personnel were allowed entry. These controls excluded residents, runners, off road vehicles, and other unauthorized entry. The Master Plan was amended with the addition of EGDY and a base road moved to prevent entry into EGDY.

Due to base improvements related to the War on Terror, a fence was incorrectly erected in the wrong location at EGDY. This error was corrected the same day and the fence relocated to further prevent entry by residents into the landfill area. Due to a generalized location for a digging permit, this construction occurred and environmental personnel did not have specific information to not authorize the construction. Future digging permits require specific proposed locations to ensure construction in authorized areas as delineated by the Master Plan.

Fort Lewis has ensured the potability of drinking water on the installation by routinely monitoring drinking water wells for contamination and shutting down wells that have the potential for TCE contamination.

### **ADDITIONAL PROGRESS**

Recommendations for improvement of the remedial action system were made in the Two Year Performance Evaluation Report in May 1998. Progress towards achieving those improvements is discussed below.

Limited data in the area to the southwest of the EGDY prevented an understanding of why the TCE plume bulged out (referred to as a "hot spot" in Two Year Performance Evaluation Report) in this direction. During the Expanded Site Investigation and the Phase 2 RI, additional fieldwork was completed in this area to determine the cause of the bulge in the TCE plume. Analytical data from groundwater grab samples were collected from direct push drive points and Geoprobe borings, and temporary piezometers were installed in this area to obtain groundwater elevation data. This new data was interpreted to illustrate groundwater flow and hence dissolved-phase TCE transport to the southwest of the back portion of the EGDY toward Murray Creek. Hence, the EGDY GTS is not fully capturing the dissolved-phase TCE plume emanating from EGDY. Once flow lines intersect Murray Creek, they then follow Murray Creek back to the west and then to the northwest, along the main axis of the TCE plume down the Logistics Center. Further supporting data and interpretation will be provided in the upcoming Phase 2 RI report.

Remedial action monitoring data reporting and interpretation was recommended for improvement by discussing vertical TCE concentration and distribution and hydraulic

gradient differences between the Vashon and Sea Level aquifers. This has subsequently been accomplished with further explanation and additional illustrative maps in RAM quarterly and annual reports.

Remedial action monitoring data reporting and interpretation was recommended for improvement by increasing the number of wells for groundwater elevation measurement and to record all water levels within a one-week period. This has subsequently been accomplished and has helped improve data quality and interpretation.

It was recommended that dedicated submersible pumps be installed in all RAM monitoring wells, and that low-flow groundwater purging and sampling methodology be used. These recommendations have been made by the purchase and installation of dedicated submersible bladder pumps for all RAM wells and through the implementation of the low-flow sampling technique.

It was also recommended that well sampling protocol be changed to optimize the RAM network. The monitoring strategy was optimized by generally incorporating more monitoring wells into the network with VOC data being collected on a slightly reduced frequency at most wells. Remedial Action Monitoring network optimization is currently underway, with the first, second, and third optimized quarters having taken place in December 2001, and March and June 2002. Groundwater sampling for lead has since been discontinued.

Additional progress made at the EGDY and Logistics Center since the last five-year review in 1997 included source area drum removal, Phase 2 RI NAPL characterization, and initial contractor procurement phases of work associated with the thermal treatment of the source area. Also, three conventional Sea Level aquifer wells were installed in December 1999 (LC-75, LC-76, and LC-77). A total of five Sea Level aquifer multi-port monitoring wells were installed April-May 2002 in the down gradient direction of the Sea Level aquifer TCE plume in order to better characterize the plume horizontal and vertical extent.

## **VI. Five-Year Review Process**

The USEPA Region 10 and Fort Lewis Public Works have been notified and are aware of the start of the second five-year review process. Members of the five-year review team are: Mr. Bob Kievit (USEPA), Ms. Marcia Knadle (USEPA), Mr. Rich Wilson (Ft. Lewis Public Works), Mr. Rick Dinicola (USGS), and Mr. Bill Goss (USACE).

A tentative review schedule has been developed with the following milestones and dates: Draft Second Five-Year Review Report due June 2002; Comments on Draft Second Five-Year Review Report due July 2002; Final Second Five-Year Review Report due September 2002; Signed Final Second Five-Year Review Report due 30 September 2002.

## **DOCUMENT REVIEW**

The following documents were reviewed as part of the second five-year review process for the Fort Lewis Logistics Center:

- (First) Five-Year Review Report
- Two-Year Performance Evaluation Report for the GTS
- Remedial Action Report for GTS
- Explanation of Significant Difference
- Final Closure Report for Trenching/Drum Removal at EGDY
- Engineering Evaluation/Cost Analysis for EGDY and Logistics Center
- Draft RA Monitoring Network Optimization Report
- EGDY/Logistics Center Draft Risk Assessment Addendum
- First Year Monitoring Report, Logistics Center RA Monitoring
- Second Year Monitoring Report, Logistics Center RA Monitoring
- Third Year Monitoring Report, Logistics Center RA Monitoring
- Fourth Year Monitoring Report, Logistics Center RA Monitoring
- Fifth Year Monitoring Report, Logistics Center RA Monitoring
- O&M Annual Report (October 1996 to November 1997), Logistics Center
- O&M Annual Report (December 1997 to November 1998), Logistics Center
- O&M Annual Report (December 1998 to November 1999), Logistics Center
- O&M Annual Report (December 1999 to November 2000), Logistics Center

For complete references of the reports listed above, see the References section of this report.

Project Remedial Action Objectives (RAOs) are stated in the ROD (US Army, USEPA, Ecology 1990), with additional RAOs provided in the ESD (US Army, USEPA, Ecology 1998). Project ARARS and clean-up levels are also stated in the ROD (US Army, USEPA, Ecology 1990).

## **DATA REVIEW**

As part of the five-year review process, data collected since the last review in September 1997 were reviewed. The data reviewed included quarterly remedial action monitoring results for TCE and DCE in groundwater at the Logistics Center. In addition, statistical analyses results performed for the Fifth Annual Monitoring Report (URS 2001c) and the Draft RAM Network Optimization Report (USACE 2001) were reviewed. Data generated during the trenching and drum source removal at EGDY (GSA 2001) were also reviewed, as well as data from the Phase 2 RI conducted at the EGDY. Also, discharge criteria data for the treatment plants were reviewed and are discussed in this section.

The results from the latest quarter in which a complete data set is available (26<sup>th</sup> quarter, March 2002) indicate that, of the 45 Vashon aquifer wells sampled, 24 wells exhibited TCE concentrations in excess of the 5 ug/l MCL and hence levels not currently compliant. In general, wells with the highest concentrations were located at EGDY (LC-64a at 12,000 ug/l, and LC-136a at 150,000 ug/l) and wells with the lowest concentrations were located on the perimeter or outside the Vashon aquifer plume (FL-4A, FL-4B, FL-6, LC-03, LC-20, LC-24, LC-26, LC-34, LC-61B, LC-111B, LC-122B, LC-137C, LC-149C, LC-167, MAMC-1, MAMC-6, PA-383, T-08, T-10, T-12B, and T-13B, all below 5 ug/l). Slight increasing trends are evident at wells LC-53, LC-116B, and LC-132, while more pronounced increasing trends are evident at LC-64A and LC-136A. The increase in TCE concentrations at LC-64A begins in March 2001, and since this was the first round of sampling after source area drum removal began, this increase is likely due to additional TCE release and dissolution associated with subsurface drum disturbance. The only well exhibiting an apparent decrease in concentration over time is LC-137C.

TCE is present in several Vashon aquifer wells to the southwest of EGDY above 5 ug/l. Based on results of the March 2002 (26<sup>th</sup> quarter) sampling round shown on **Attachment 2**, well LC-53 contained TCE at a concentration of 230 ug/l and FL-2 contained TCE at a concentration of 330 ug/l. Vashon aquifer wells 9700-MW-2, FL-1, LC-50, and LC-51 have also historically had TCE above 5 ug/l and are located to the southwest of EGDY. These results suggest that instead of the dissolved-phase TCE plume being captured by the EGDY GTS, a portion of the plume is diverting around the system to the southwest and then converges back toward the main axis of the plume down the axis of the Logistics Center.

All groundwater extraction wells except three have consistently been extracting groundwater in excess of the 5 ug/l TCE MCL. LX-13, LX-14, and LX-15 have been extracting groundwater bordering on the 5 ug/l TCE regulatory level. Since extraction wells are aquifer treatment points, it is expected that TCE concentrations from these wells are high. This is because areas of higher TCE concentrations were preferentially selected as extraction well locations in order to pump-and-treat in the most effective manner. It is anticipated that all extraction wells at both the I-5 and EGDY systems are to be operated well into the foreseeable future. It is also noteworthy that, based on historical data from well FL-6 immediately south of LX-1, a small portion of the dissolved-phase TCE plume may not be captured by the I-5 extraction system.

For Sea Level aquifer well results from the latest quarter in which a complete data set is available (26<sup>th</sup> quarter, March 2002), of the 21 wells sampled, eight exhibited TCE concentrations in excess of the 5 ug/l MCL regulatory level. Hence TCE levels are non-compliant in those eight wells. LC-50D, which is located approximately 1,500 feet west-southwest of EGDY but up gradient of the main Sea Level aquifer plume, contains TCE at a slightly elevated level (2.7 ug/l). The TCE concentrations at all other Sea Level aquifer wells create a bulls eye shaped plume centered at wells LC-41D and LC-69D (maximum TCE at 120 ug/l). A slight decreasing TCE concentration trend is apparent at well LC-77D, and a slight increasing trend is evident at well LC-74D. The offset in TCE

concentration at LC-66D from September 1999 to December 2000 is a result of the pump intake being set 22 feet above the screen; hence analytical data from this period are biased low. Additionally, TCE concentrations in LC-40D, LC-72D, and LC-73D were all biased low during the period between September 1999 and December 2000 likely resulting from a change to low-flow sampling with the pump intake set above the well's screened interval. The sample intake has since been altered to correspond with the screened interval. All Sea Level aquifer TCE trends are slight in magnitude.

All three established surface water sample locations along Murray Creek have been below 5 ug/l TCE for all quarters monitored. Location SW-MC-4 has experienced a slight decrease in TCE concentration over time. Since the action level for TCE in surface water is 80 ug/l, all surface water sampling points are compliant with current regulatory limits and are anticipated to be so also in the foreseeable future.

All discharge criteria from both the I-5 and EGDY groundwater treatment plants have been met for the period of interest for this five-year review (1997-2002). For the I-5 system, the discharge criteria is <5 ug/l for TCE in groundwater and <75 pounds per month (lb/mo) TCE in air. For the EGDY system, the discharge criteria is <5 ug/l TCE in groundwater and <325 lbs/mo in air. Between 1997-2002, effluent TCE concentrations in groundwater have ranged from 0.5 to 1.7 ug/l from the I-5 system and from non-detect (<1.2) to 1.6 ug/l from the EGDY system. The calculated TCE emissions rate from the I-5 plant has ranged from 0.51 to 1.61 lb/day (16 to 49 lb/mo), and the EGDY plant TCE emissions have ranged from 0.9 to 2.37 lb/day (27 to 72 lb/mo).

Keeping in mind the NAPL source of TCE has not yet been treated or completely removed, coupled with the fact that TCE concentrations in wells have not changed drastically over time, the fact that many wells continue to contain high levels of TCE is not unexpected. Once the source area is removed from the groundwater system, dissolved phase TCE concentrations at the Logistics Center are expected to show a gradual decrease. See **Tables 5 through 9** for analytical sampling data summaries of TCE, DCE, TCA, PCE, and VC from pre-system start-up up to the 26<sup>th</sup> quarter for Vashon and Sea Level aquifer monitoring wells and surface water locations. See **Tables 10 through 14** for analytical sampling data summaries of TCE, DCE, TCA, PCE, and VC from pre-system start-up up to the 26<sup>th</sup> quarter for extraction wells. Also see **Appendix 1** for graphical representations of TCE over time for all monitoring wells and surface water locations monitored for periods greater than two sampling events.

All negotiated changes made to the remedial action monitoring network based on recommendations in the Draft RAM Network Optimization Report (USACE 2001) and subsequent comment resolution meetings between the USACE, USEPA, and USGS have been implemented with the exception of new Vashon aquifer well installation. This new well installation is scheduled for completion during FY2003. Changes to the remedial action monitoring network are summarized in **Table 15** (under column entitled "revised sample frequency"). December 2001 (25<sup>th</sup> quarter) marked the beginning of sampling

based on the newly optimized sampling strategy. A framework for further optimizing the sampling frequency has been established, and consists of the following:

- As stated in the Draft RAM Network Optimization Report (USACE 2001), re-evaluation of sampling frequency will occur for those wells being sampled on a quarterly or semi-annual basis after eight quarters under the optimized sampling schedule (Eighth quarter will occur in September 2003), and
- The frequency of sampling will be re-evaluated for any well being sampled less than quarterly in which TCE concentration is reported to be outside the historical maximum or minimum.

At this time, no additional changes are being recommended to the remedial action monitoring program for the Ft. Lewis Logistics Center other than in the cases stated above.

No formal site inspections were performed during this five-year review period. Routine O&M checks were performed for the GTS in which detailed inspections of the extraction wells and treatment plant systems were conducted.

No interviews were conducted during this five-year review period pertaining to the Fort Lewis Logistics Center.

## **VII. Technical Assessment**

### **QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?**

Answer: No.

The review of documents, ARARs, RAOs, risk assumptions, and current site data indicates that the remedy is proceeding as intended by the ROD, as modified by the ESD; however, the remedy is not functioning as intended because the remedy of source removal specified in the ESD has not yet been fully implemented. The groundwater treatment system is remediating the extracted groundwater to levels that are protective of human health and the environment in the Vashon aquifer; however, it has become apparent that the timeframe for complete groundwater cleanup will be in excess of 30 years. Also, institutional controls have achieved the remedial action project goal of reducing exposure to the contaminated groundwater.

Operation and maintenance of the GTS has, on the whole, been effective. Several extraction wells have experienced reduced capacity due to biofouling of the pump intake and well screen and casing. Wells experiencing documented biofouling have been addressed by acid-treatment and redevelopment. It is believed that biofouling is occurring at many of the wells in both extraction systems (I-5 and EGDY) and is a contributing factor in general decline of well capacities at many of the wells. With this in mind, a preventative maintenance program to prevent biofouling may need to be

implemented in order for the GTS to remain fully functional as designed. O&M annual costs are relatively consistent with original estimates, and are lower than original estimates when total costs (including electricity) are factored in.

Remedial action monitoring network optimization occurred prior to this review. The monitoring well network was optimized to reduce redundancy in data collection locations and in data that was not helpful in deciphering contaminant behavior at a particular well location. Part of the optimization included the addition of monitoring wells for sampling to fill spatial data gaps in the monitoring network. Additionally, cost of monitoring is to be reduced as a result of optimization. While a few wells have experienced steady increases in TCE concentrations over time, and others have experienced decreases over time, on the whole, TCE concentrations have remained stable in time and space, indicating that the TCE plume is not appreciably changing. The disturbance of subsurface soils and NAPL source due to the drum removal and any future thermal treatment actions is likely to temporarily alter the stability of the plume beneath the EGDY, however, this change should be apparent in the future remedial action monitoring network data. Once the NAPL source area removal and treatment is completed, it is believed that dissolved-phase TCE contamination will slowly decrease throughout the monitoring network over time.

The institutional controls that are in place include prohibitions on the use or disturbance of groundwater within the limits of the Vashon and Sea Level aquifer TCE plumes until cleanup levels are achieved, and any other activities or actions that might interfere with the implemented remedy. No activities were observed that would have violated the institutional controls. Fort Lewis water supply well PS Well 13 was shut down after TCE was detected in a groundwater sample from this Sea Level aquifer well. Although TCE concentrations at PS Well 13 have been just above detection limits and hence below the 5 ug/l MCL, this demonstrates that the control to prohibit groundwater use or disturbance near the TCE plumes is working. No new uses of groundwater were observed. A fence with locking gates and warning signs along the portion of the EGDY abutting East Lincoln Drive has been erected and is in good repair. A tank trail perimeter fence was mistakenly routed through the front of the EGDY in November 2001 but was promptly taken down and rerouted around the EGDY, and tied into the existing EGDY fence line north of the source area contamination along East Lincoln Drive.

The source area drum removal at EGDY was successfully implemented in 2001. This action removed buried drums and some associated NAPL and contaminated soil from the EGDY – the source area for the Logistics Center TCE plume. Work is underway to secure a thermal treatment contractor to remove NAPL remaining in the vadose and saturated zones at the EGDY.

**QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF REMEDY SELECTION STILL VALID?**

Answer: No.

New potential exposure pathways were identified in the Draft Risk Assessment Addendum (URS 2001b) that resulted in a “No” response to Question B. Exposure assumptions were added to the health risk conceptual site model, including human ingestion, inhalation, and dermal exposure to Sea Level aquifer groundwater, inhalation of Vashon aquifer groundwater (via volatilization of VOCs into subsurface soil and into Logistics Center buildings), and ingestion, dermal contact, and inhalation from soil within EGDY. Results of the risk assessment addendum indicated risks and hazards from domestic use of Sea Level aquifer groundwater were above target health goals, primarily due to TCE. There are no current users of the contaminated portion of the Sea Level aquifer as a water supply; however, the potential exists for future exposures to occur. The contaminant plumes within the Sea Level and Vashon aquifers are both within the 10-year wellhead protection areas for Fort Lewis and Lakewood Water District Wells (Economic and Engineering Services, Inc. 1997; Public Works Headquarters-I Corps and Fort Lewis 1996; Tacoma-Pierce County Health Department 2001). Thus, there is a potential that contaminants in the plumes could reach some drinking water wells. Results also indicated risks and hazards due to indoor inhalation of vapors from the upper aquifer were within USEPA’s acceptable risk range for both workers and residents, indicating volatilization of contaminants is not a concern at the Logistics Center. Also, risks and hazards for construction workers disturbing soil in the EGDY were above the target health goals for both cancer risks and noncancer hazards, although the assessment was based on very conservative (i.e., highest concentration) data.

The Draft Risk Assessment Addendum (URS 2001b) did not include any new contaminants of concern. A draft, newly proposed TCE slope factor value is available, and was considered in the risk calculations in the RA Addendum that was not used in the original baseline risk assessment. The parameter values chosen, including TCE slope factor, are considered to be conservative in evaluating risk and developing risk-based cleanup levels. No change to these assumptions or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy. The remedy is progressing as expected.

The remedial action objective (RAO) of restoring the Sea Level aquifer to Class 1 (drinking water) status was set forth in the ROD. While this RAO has not changed, the method to achieve the objective has changed. The ROD reserved the possibility for extending the groundwater extraction and treatment in on-site treatment facilities to the Sea Level aquifer if contamination above regulatory levels was found. However, subsequent Sea Level aquifer studies raised the concern that if pump-and-treat were operated in the Sea Level aquifer, it could possibly result in an expansion of the Sea Level aquifer plume by drawing contamination down from the Vashon aquifer through a permeable window where the confining unit is locally more permeable or absent. The ESD was written to account for the new Sea Level aquifer findings, and shifts the focus of the Sea Level aquifer plume from a reactive presumed remedy of pump-and-treat, to a proactive stance in removing and/or treating the source contributing to the Sea Level aquifer plume. The overall Logistics Center remedy has been revised to include the

accelerated cleanup of the Vashon aquifer through source control at the EGDY and the use of innovative technologies in the Vashon aquifer, and the conductance of additional studies on the transport of contaminants to and through the Sea Level aquifer to better understand the fate and transport of contaminants in the Sea Level aquifer.

There have been no adverse changes in the physical conditions of the site that would affect the protectiveness of the remedy. The source area drum removal has helped to reduce the amount of NAPL dissolving into groundwater, and no additional sources were found outside the EGDY. The site remedy, including the GTS along with NAPL source removal at the EGDY, is progressing as expected.

The principal ARAR that still must be met at this time and that has been evaluated is the Safe Drinking Water Act (SDWA) (40 CFR 141.11-141-16) from which many of the groundwater cleanup levels were derived (MCLs), and MCL Goals. There have been no changes in these ARARs and no new standards or To Be Considereds (TBCs) affecting the protectiveness of the remedy.

**QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?**

Answer: Yes.

New data and subsequent interpretation have come to light since the last five-year review that impacts contaminant capture by the primary EGDY extraction wells. Groundwater flow direction in the southwestern-most portion of the EGDY is to the southwest, counter to the overall northwest trend of groundwater flow in the Logistics Center. Since dissolved-phase TCE movement is in the direction of groundwater flow, the TCE plume bulges out to the southwest of EGDY. Groundwater flow and the TCE plume then turn to the north, generally following the flow direction of Murray Creek, until they meet up with the site-wide general flow direction to the northwest. The dissolved-phase TCE contamination in Vashon aquifer groundwater exiting the southwestern portion of the EGDY does travel under approximately one-third of the Madigan Housing Complex, although residents of the community do not use the water for potable supply. Also, based on the revised Risk Assessment Addendum calculations, the indoor air exposure pathway for TCE volatilization has been evaluated for residents of the Madigan Housing Area using the Johnson-Ettinger model and indoor air is not considered to pose a risk to this community. It is recognized that there are some uncertainties associated with the Johnson-Ettinger model and its sensitivity to various input parameters. It is believed that the majority of the contamination bulging to the southwest of the EGDY ultimately is captured by the I-5 extraction well field but is at least partially missed by the secondary EGDY well field. A portion of the contamination that is missed by the secondary EGDY well field also eludes the I-5 GTS by entering the Sea Level aquifer prior to the I-5 well field through the permeable window between the Vashon and Sea Level aquifers. Additionally, a small portion of the dissolved-phase TCE plume may be circumventing the I-5 extraction well field by flowing around LX-1 to the southwest based on historical data from both LX-1 and FL 6.

The large amount of free-phase TCE and other NAPLs at the EGDY source area was semi-quantified during the recent Phase 2 RI. Since this information has come to light since the ROD was written, it is evident that the GTS mandated in the ROD would be ineffective at remediating groundwater to MCLs within 30 years without source removal (as recommended in the ESD). Source removal, including drum removal (GSA 2001) and future thermal treatment, combined with an optimized GTS is expected to re-establish pump-and-treat as an effective long-term protective remedy.

No ecological targets were identified during the addendum risk assessments and none were identified during this five-year review, and therefore monitoring of ecological targets is not necessary. All surface water samples analyzed from Murray Creek found TCE at levels well below the remediation goal of 80 ug/l (generally about 1 ug/l). No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

#### **TECHNICAL ASSESSMENT SUMMARY**

According to the data reviewed, the GTS remedy is generally functioning as intended by the ROD, as modified by the ESD. Aggressive source removal and/or treatment and removal are progressing as intended by the ESD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy, and the recent understanding in localized groundwater flow and TCE transport to the southwest of EGDY does not ultimately affect protectiveness except for the portion that may bypass the EGDY treatment system to enter the Sea Level aquifer. TCE concentrations southwest of LX-1 in the upper Vashon and beneath the I-5 well field in the lower Vashon will continue to be monitored to determine if full plume capture is being achieved or not. Although a new slope factor and associated toxicity value for TCE have been used in toxicity calculations in the Final Risk Assessment Addendum (unpublished as of 19 September 2002), the conclusions contained in the Draft RA Addendum (URS 2001) remain unchanged. There have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

#### **VIII. Issues**

The following table summarizes outstanding issues to be addressed at the Fort Lewis Logistics Center.

**Table 16: Outstanding Issues**

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
GTS extraction wells have experienced gradual decrease in capacity and several wells have experienced biofouling, indicating biofouling problem may be widespread.	N	Y
Bulge in TCE plume to SW of EGDY determined to be from localized difference in GW flow from regional trend. Several monitoring wells and piezometers exist in this area to continue monitoring flow direction and contaminant concentrations.	N	N
I-5 system may not be capturing all of TCE plume SW of LX-1	N	Y
Beachcomber Complex well discovered to be within Vashon TCE plume. Results non-detect for TCE and all other VOCs July 02	N	Y
Sea Level aquifer contaminant plume character and condition (i.e., expanding, contracting, or stable) not defined and capture or containment not currently addressed. Innovative technologies evaluated for Vashon aquifer will also address reduction in contaminant migration to Sea Level aquifer through window.	Y	Y

## IX. Recommendations and Follow-up Actions

The following table summarizes recommendations and follow-up actions associated with outstanding issues pertaining to the Fort Lewis Logistics Center site.

**Table 17: Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Source Removal	Treat Source Area NAPL (EGDY) via Thermal Treatment Technology	Ft. Lewis	USEPA	Award Contract 2002	N	Y
Decreased GTS Well Capacity	Implement Preventative Maintenance Schedule	Ft. Lewis	USEPA	2003	N	Y
RA Monitoring Optimization	Further Optimize MW Network after 8 Quarters	Ft. Lewis	USEPA	2003-2004	N	N

**Table 17: Recommendations and Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Optimize GTS	Optimize GTS to Reduce Total Operating Time & Cost, & Assure Complete Plume Capture	Ft. Lewis	USEPA	After Completion of Thermal Treatment (minor adjustments could be made sooner)	N	Y
Institutional Controls	The EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities will be implemented where feasible and concurrent to DoD guidance	Ft. Lewis	USEPA	Jan 2004	Y	Y
Beachcomber Complex Well	Insure Well is Periodically Sampled for TCE	Ft. Lewis	USEPA	TBD	N	Y
Sea Level aquifer	Conduct Source Treatment at EGDY; Continue Innovative Technology Evaluation for Expediting Vashon Aquifer Cleanup and to Reduce Contamination Entering Sea Level Aquifer; Sample new wells; Continue to Evaluate the Sea Level Aquifer Contamination	Ft. Lewis	USEPA	Source Treatment Contract Award 2002; others ongoing/2003	Y	Y

## X. Protectiveness Statement

The remedy at the Fort Lewis Logistics Center currently protects human health and the environment. The remedy continues to be protective by keeping the Vashon aquifer plume in check through the GTS, by prohibiting the use of groundwater within the Vashon and Sea Level aquifer plumes through institutional controls, and by continued monitoring of the Sea Level aquifer plume. This remedy protects human health and the environment in the short term; however, without source removal, the anticipated duration of the GTS would be much longer than the original remediation timeframe of 30 years.

In order for the remedy to be protective in the long-term, the TCE NAPL source must be removed to cut off the source of the Logistics Center dissolved-phase plume. The remedy of source area drum removal took place in 2001, and in-situ thermal remediation is moving forward at the site to remove the remainder of the TCE NAPL at the EGDY. It is believed that implementation of NAPL source removal, combined with dissolved-phase treatment via the GTS, will ensure long-term protectiveness of human health and the environment.

Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples as part of the RA monitoring program to fully evaluate potential Vashon and Sea Level aquifer migration of the contaminant plume down gradient from the source area/treatment area and towards Tillicum and American Lake. Additional sampling and analysis is ongoing.

## **XI. Next Review**

The Fort Lewis Logistics Center is required to have a third five-year review. The site does not yet qualify for listing on the Construction Completion List since all components of the selected remedy for the site have not been completed. Hence, a third Five-Year Review Report will be required. The third five-year review will be conducted by September 2007, five years from the anticipated finalization of this report.

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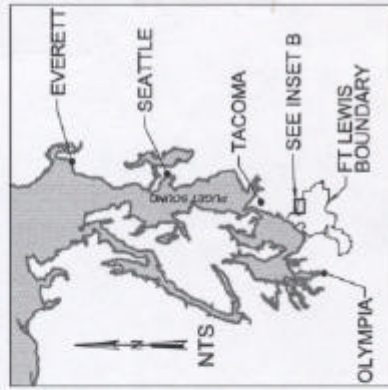
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## **Attachments**



INSET B



INSET A

**URS**

U.S. ARMY  
ENGINEER DISTRICT OFFICE  
CORPS OF ENGINEERS  
SEATTLE WASHINGTON

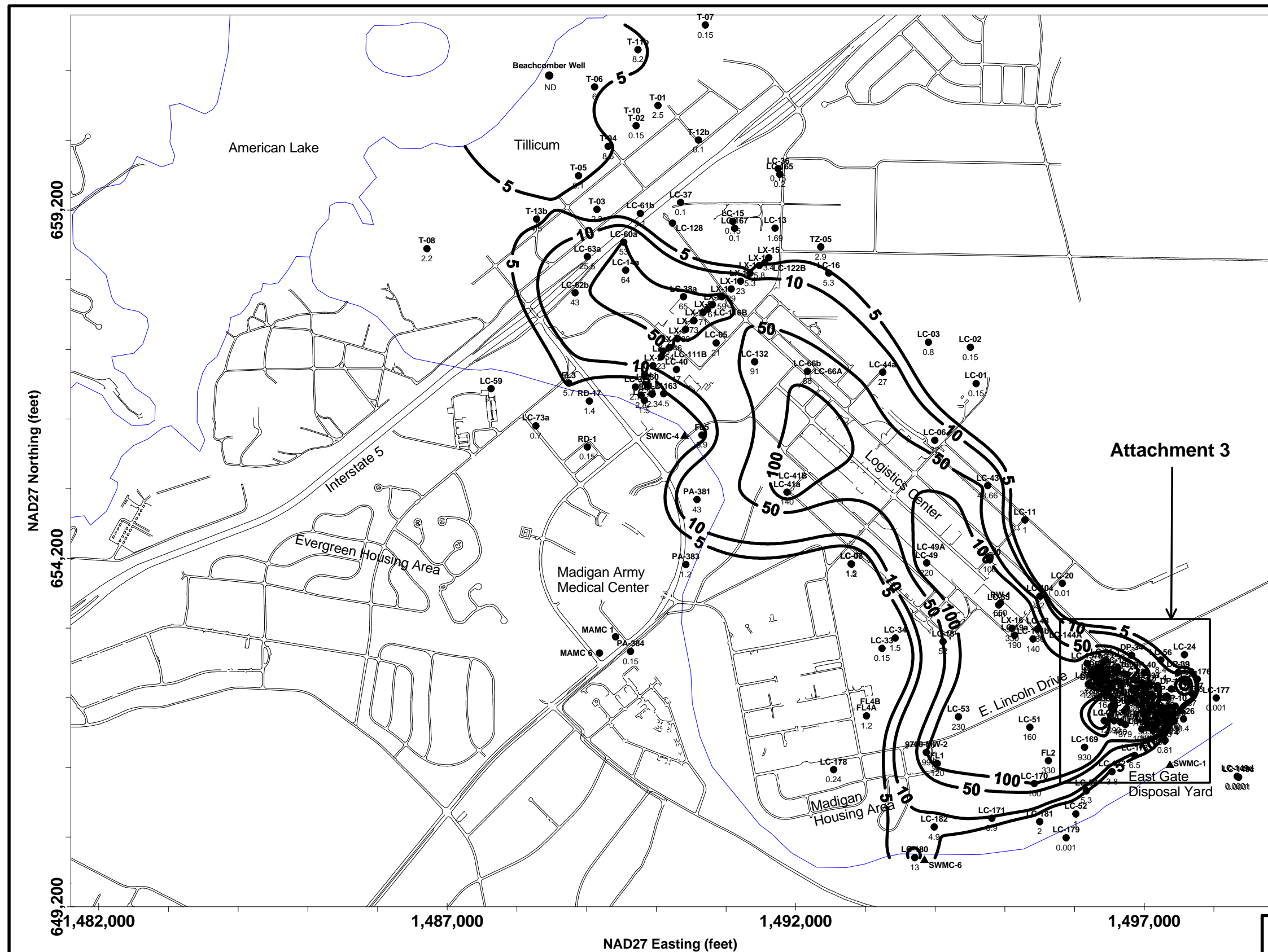
EAST GATE DISPOSAL YARD AND  
LOGISTICS CENTER

SITE LOCATION

FT. LEWIS

WASHINGTON

**ATTACHMENT 1**

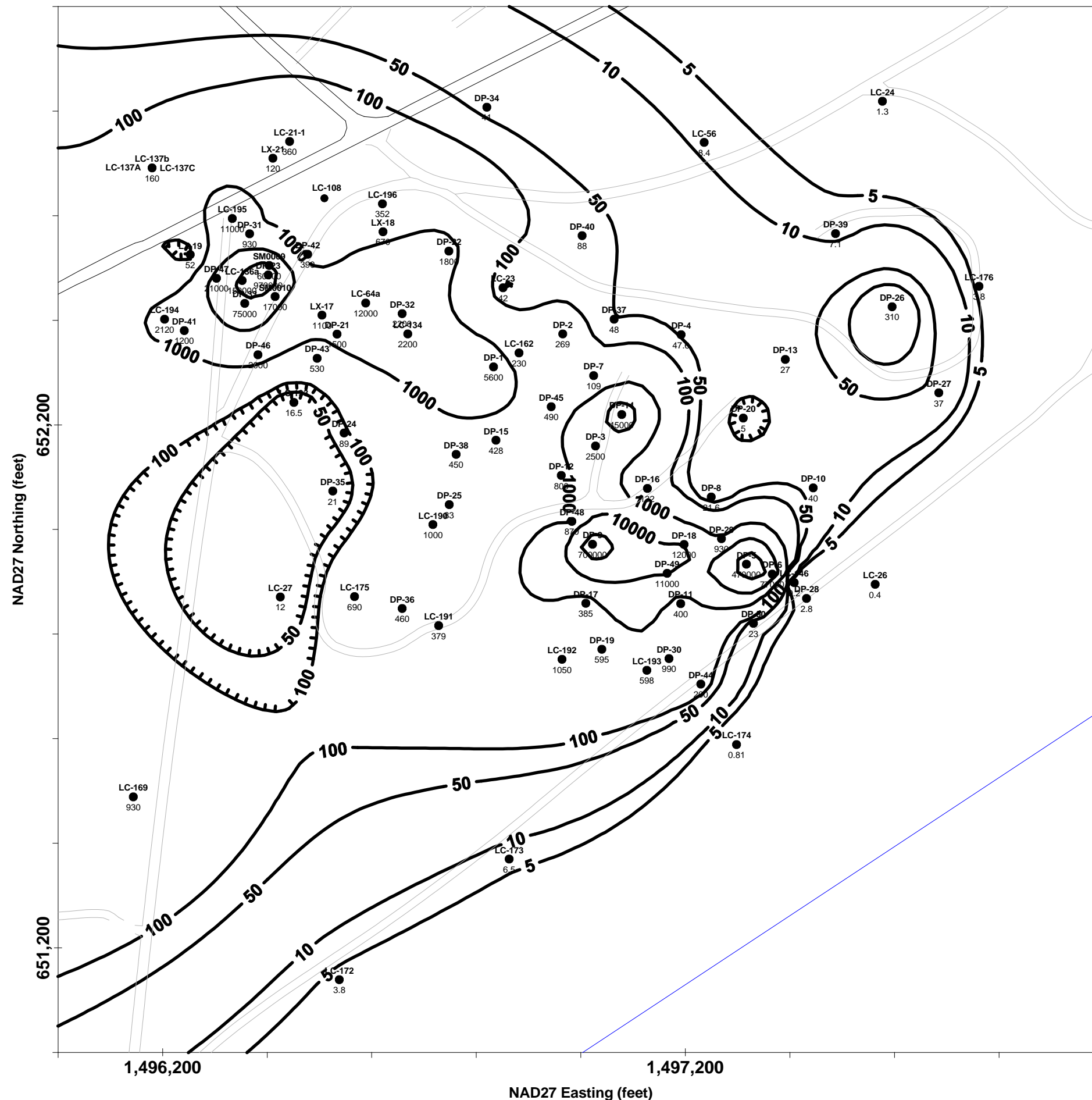


**LEGEND:**

- 0.8 March 2002 groundwater sampling point. TCE concentration values shown in ppb.
- Groundwater TCE concentration contour.
- ▲ Surface Water Sample Location

**NOTES:**

1. Contour values represent estimated TCE concentrations in parts per billion (ppb) for the Vashon Aquifer.
2. Data used is from the March, 2002 sampling event.
3. The March 2002 data was supplemented with data values from earlier sampling events.
4. Countours were computer-generated by SURFER using Kriging. Countours are based only on data points shown and may not represent actual conditions near boundaries of drawing.
5. Contours are provided for vizualization purposes only. Regulatory compliance and evaluation of groundwater flow and plume migration shall be based on actual values measured at each data point.



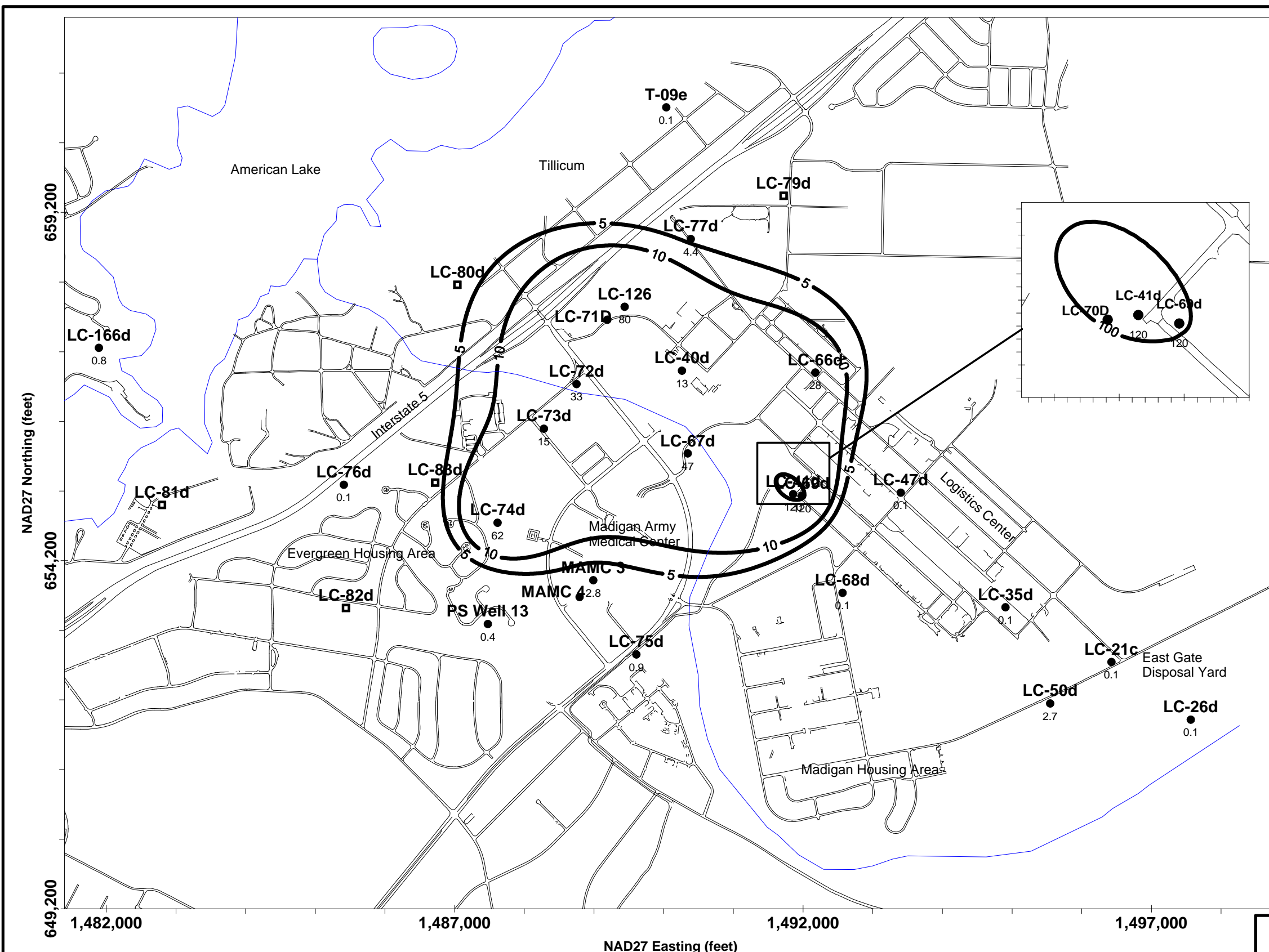
**LEGEND:**

- 0.8 March 2002 groundwater sampling point. TCE concentration values shown in ppb.
- Groundwater TCE concentration contour.




**NOTES:**

1. Contour values represent estimated TCE concentrations in parts per billion (ppb) for the Vashon Aquifer.
2. Data used is from the March, 2002 sampling event.
3. The March 2002 data was supplemented with data values from earlier sampling events.
4. Countours were computer-generated by SURFER using Kriging. Countours are based only on data points shown and may not represent actual conditions near boundaries of drawing.
5. Contours are provided for vizualization purposes only. Regulatory compliance and evaluation of groundwater flow and plume migration shall be based on actual values measured at each data point.

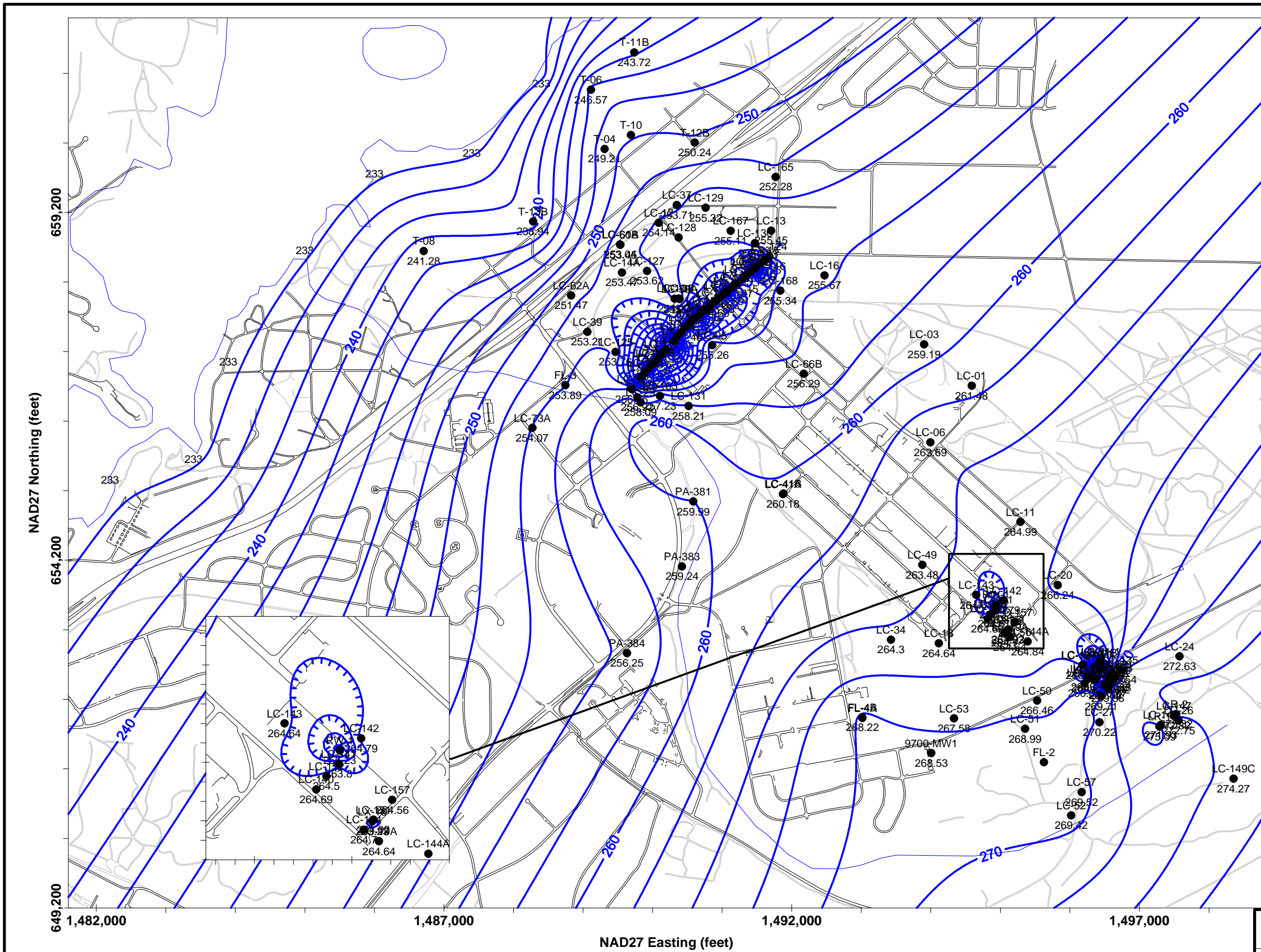
U.S. ARMY CORPS OF ENGINEERS SEATTLE DISTRICT		
Logistics Center Second Five-Year Review Report (8/15/02)		
Vashon Aquifer TCE Plume Map - EGDY Inset		
Fort Lewis	Attachment 3	Washington

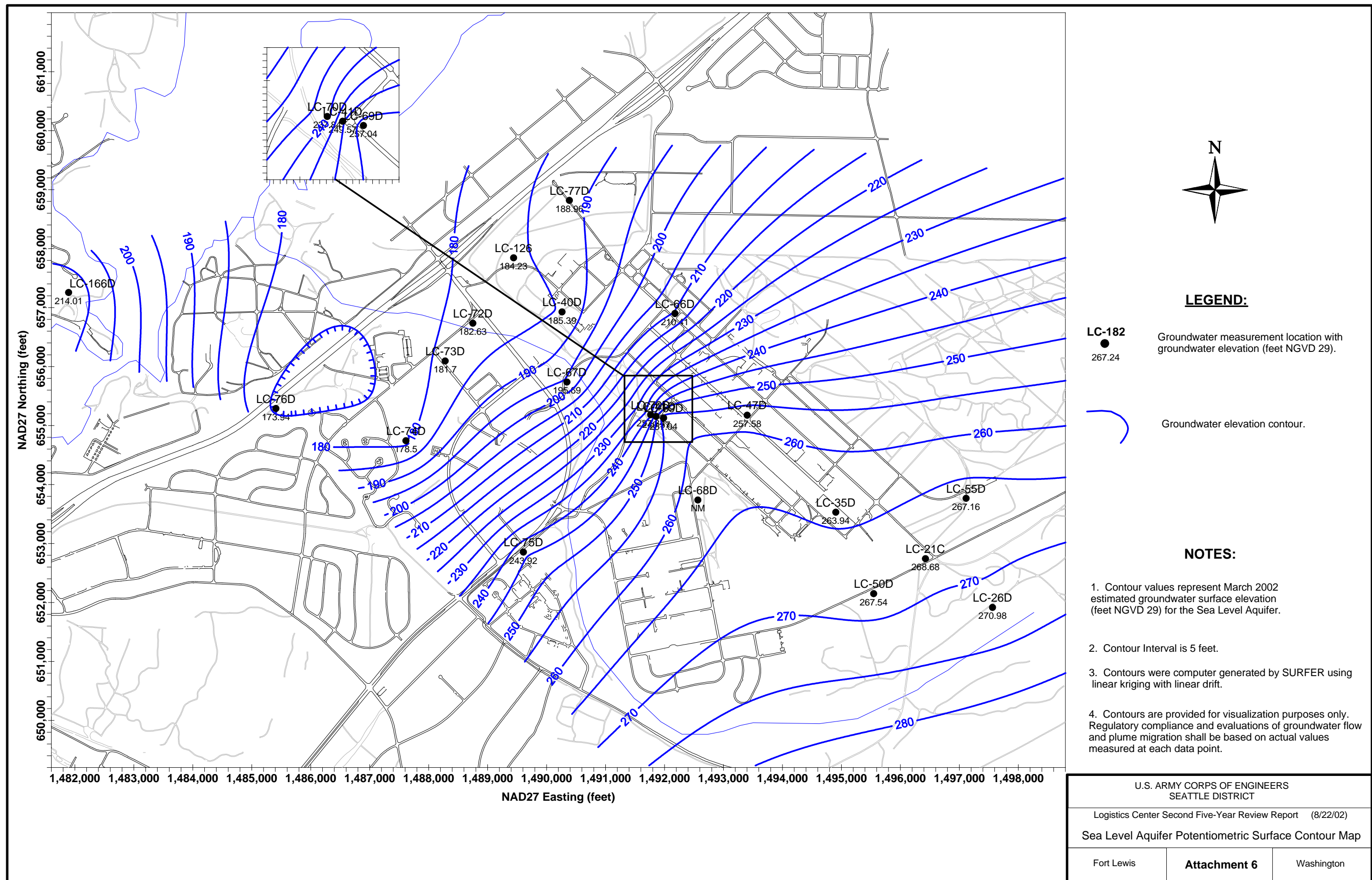


**LEGEND:**

-  New Lower Aquifer well
-  March 2002 groundwater sampling point. TCE concentration values shown in ppb.
-  Groundwater TCE concentration contour.

- NOTES:
1. Contour values represent estimated TCE concentrations in parts per billion (ppb) for the Sea Level Aquifer.
  2. Data used is from the March, 2002 sampling event. One-half the detection limit was used for non-detect values.
  3. The March 2002 data was supplemented with data values from earlier sampling events.
  4. Countours were computer-generated by SURFER using Kriging. Countours are based only on data points shown and may not represent actual conditions near boundaries of drawing where data is sparse, such as NW of Interstate 5.
  5. Contours are provided for vizualization purposes only. Regulatory compliance and evaluation of groundwater flow and plume migration shall be based on actual values measured at each data point.







**Tables Not Embedded in Body of Report  
(Multiple Pages)**

**Table 2**  
**Groundwater Treatment System Performance Data Summary**

	Startup							First Year of Monitoring							
	Startup 9/5/1995	Event 1 9/7/1995	Event 2 9/11/1995	Event 3 9/13/1995	Event 4 9/19/1995	Event 5 9/25/1995	Event 6 10/3/1995	Event 7 10/30/1995	Event 8 12/11/1995	Event 9 3/13/1996	Event 10 4/9/1996	Event 11 5/14/1996	Event 12 6/17/1996	Event 13 7/10/1996	Event 14 8/14/1996
Influent TCE (µg/L)															
East Gate	395	410	290	313	280	400	270	390	200	340	270	220	245	250	310
I-5	62	61	47	51	43	50	68	47	--	53	46	50	53	49	61
Effluent TCE (µg/L)															
East Gate	5.1	13	4.9	5.4	4.0	4.1	1.3	5.2	1.2	0.83	0.70	0.71	0.80	0.34	0.50
I-5	1.6	0.8	1.4	1.7	0.96	0.2 U	0.46	1.6	--	0.43	0.79	0.77	1.20	0.88	1.0
TCE Removal (%)															
East Gate	98.71%	96.84%	98.31%	98.28%	98.57%	98.99%	99.52%	98.67%	99.40%	99.76%	99.74%	99.68%	99.67%	99.86%	99.84%
I-5	97.45%	98.77%	97.02%	96.67%	97.74%	>99.9%	99.32%	96.60%	--	99.19%	98.28%	98.46%	97.74%	98.20%	98.36%
Flow Rate (gpm)															
East Gate	780	800	800	800	800	802	803	682	578	800	786	788	780	646	640
I-5	1880	1955	1928	1938	1833	1816	1862	1860	--	1765	1860	1870	1854	1739	1630
TCE Emission (lb/day)															
East Gate	3.65	3.82	2.74	2.96	2.65	3.82	2.59	3.15	1.38	3.26	2.54	2.08	2.29	1.94	2.38
I-5	1.37	1.42	1.06	1.15	0.92	1.09	1.51	1.01	--	1.12	1.01	1.11	1.15	1.01	1.18
TCE Emission (lbs/period)															
East Gate	3.65	7.63	10.96	5.92	15.92	22.90	20.74	85.16	16.57	300.01	68.68	74.76	77.83	44.58	83.32
I-5	1.37	2.83	4.23	2.30	5.49	6.55	12.09	27.40	--	102.59	27.29	39.83	39.24	23.13	41.14

	Second Year of Monitoring												
	Event 15 11/20/1996	Event 16 12/18/1996	Event 17 1/15/1997	Event 18 2/14/1997	Event 19 3/17/1997	Event 20 4/23/1997	Event 21 5/12/1997	Event 22 6/16/1997	Event 23 7/15/1997	Event 24 8/22/1997	Event 25 9/23/1997	Event 26 10/22/1997	Event 27 11/21/1997
Influent TCE (µg/L)													
East Gate	270	240	190	220	160	270	210	200	170	220	210	210	210
I-5	54	49	52	55	53	62	47	44	47	45	42	50	38
Effluent TCE (µg/L)													
East Gate	1.4	1.6	1.6	1.1	1.2 U	0.6	1.2 U	0.37	0.4	0.97	0.4	1.0	0.89
I-5	1.6	1.4	1.4	1.65	1.5	1.7	0.97	1.65	1.5	1.4	1.0	1.2	1.1
TCE Removal (%)													
East Gate	99.48%	99.33%	99.16%	99.50%	>99.9%	99.78%	>99.9%	99.82%	99.76%	99.56%	99.81%	99.52%	99.58%
I-5	97.04%	97.14%	97.31%	97.00%	97.17%	97.26%	97.94%	96.25%	96.81%	96.89%	97.62%	97.60%	97.11%
Flow Rate (gpm)													
East Gate	783	786	787	789	516	652	647	648	645	773	746	740	735
I-5	2049	2074	2080	2084	2086	2068	2068	2035	2046	2013	1968	1941	1935
TCE Emission (lb/day)													
East Gate	2.53	2.25	1.78	2.08	0.99	2.12	1.63	1.56	1.32	2.04	1.88	1.87	1.86
I-5	1.29	1.19	1.26	1.34	1.29	1.50	1.14	1.04	1.12	1.05	0.97	1.14	0.86
TCE Emission (lbs/period)													
East Gate	247.7	65.31	49.89	62.27	30.76	76.16	31.03	54.51	38.22	77.66	60.25	54.16	55.65
I-5	126.46	34.41	35.42	40.09	40.02	53.95	21.74	36.25	32.45	40.08	31.03	33.01	25.74

**Table 2**  
**Groundwater Treatment System Performance Data Summary**

	Third Year of Monitoring													
	Event 28 12/16/1997	Event 29 1/28/1998	Event 30 2/19/1998	Event 31 3/23/1998	Event 32 4/15/1998	Event 33 5/19/1998	Event 34 6/18/1998	Event 35 7/16/1998	Event 36 8/31/1998	Event 37 10/15/1998	Event 38 11/18/1998			
Influent TCE (ug/L)														
East Gate	210	190	200	190	200	140	200	210	230	290	300			
I-5	38	39	44	43	49	37	71	44	49	53	45			
Effluent TCE (ug/L)														
East Gate	0.97	0.94	0.9	0.81	0.8	1.2	0.75	1.2	0.3	0.2	0.2			
I-5	1.35	1.3	1.3	1.4	1.1	0.53	1.35	0.73	1.1	0.7	0.6			
TCE Removal (%)														
East Gate	99.54%	99.51%	99.55%	99.57%	99.60%	99.14%	99.63%	99.43%	99.87%	99.93%	99.93%			
I-5	96.45%	96.67%	97.05%	96.74%	97.76%	98.57%	98.10%	98.34%	97.76%	98.68%	98.67%			
Flow Rate (gpm)														
East Gate	763	748	764	745	731	602	706	697	505	500	486			
I-5	1954	2010	1992	1987	1959	1987	1925	1790	1731	1676	1663			
TCE Emission (lb/day)														
East Gate	1.93	1.71	1.84	1.70	1.76	1.00	1.69	1.75	1.39	1.74	1.75			
I-5	0.86	0.91	1.02	0.99	1.13	0.87	1.61	0.93	1.00	1.05	0.89			
TCE Emission (lbs/period)														
East Gate	50.07	73.44	40.40	54.44	38.66	34.14	50.72	48.97	64.13	78.36	59.54			
I-5	22.38	39.16	22.49	31.79	24.81	29.61	48.34	26.06	45.84	47.41	30.17			

	Fourth Year of Monitoring													
	Event 39 12/15/1998	Event 40 1/1/1999	Event 41 2/10/1999	Event 42 3/17/1999	Event 43 4/27/1999	Event 44 5/12/1999	Event 45 6/16/1999	Event 46 7/14/1999	Event 47 8/26/1999	Event 48 9/15/1999	Event 49 10/13/1999	Event 50 11/17/1999		
Influent TCE (ug/L)														
East Gate	380	--	230	280	310	220	220	240	250	190	240	190		
I-5	44	--	46	49	61	50	48	54	51	46	--	37		
Effluent TCE (ug/L)														
East Gate	0.4	--	0.4	0.3	0.3	0.2 U	0.3	0.2	0.2	0.3	0.2 J	0.2 U		
I-5	0.65	--	0.75	0.95	0.75	0.85	1.4	0.95	1.1	1.2	--	0.9		
TCE Removal (%)														
East Gate	99.89%	--	99.83%	99.89%	99.90%	>99.9%	99.86%	99.92%	99.92%	99.84%	99.92%	>99.9%		
I-5	98.52%	--	98.37%	98.06%	98.77%	98.30%	97.08%	98.24%	97.84%	97.39%	--	97.57%		
Flow Rate (gpm)														
East Gate	520	--	546	543	523	518	520	514	495	486	480	480		
I-5	1784	--	1884	1893	1842	1968	1942	1900	1760	1661	--	1681		
TCE Emission (lb/day)														
East Gate	2.37	--	1.51	1.83	1.95	1.37	1.37	1.48	1.49	1.11	1.38	1.09		
I-5	0.93	--	1.02	1.09	1.33	1.16	1.09	1.21	1.06	0.89	--	0.73		
TCE Emission (lbs/period)														
East Gate	64.05	--	85.88	63.88	79.81	20.54	48.06	41.48	63.90	22.16	38.73	38.32		
I-5	25.09	--	58.40	38.26	54.69	17.44	38.07	33.92	45.39	17.89	--	25.53		

**Table 2**  
**Groundwater Treatment System Performance Data Summary**

	Fifth Year of Monitoring											
	Event 51 12/15/1999	Event 52 1/18/2000	Event 53 2/16/2000	Event 54 3/15/2000	Event 55 4/12/2000	Event 56 5/17/2000	Event 57 6/13/2000	Event 58 7/18/2000	Event 59 8/14/2000	Event 60 9/20/2000	Event 61 10/24/2000	Event 62 11/21/2000
Influent TCE (µg/L)												
East Gate	270	220	180	200	190	180	190	180	220	190	200	180
I-5	48	47	44	44	45	72	44	49	46	38	39 (37)	36 (34)
Effluent TCE (µg/L)												
East Gate	0.3	0.2	0.2	0.3	0.2	0.2	0.2 U	0.2	0.2 U	0.2 U	0.2 U	0.2 U
I-5	1.1	0.9	0.9	1.0	0.9	0.9	0.9 (0.9)	1.1	0.8	0.5 (0.6)	0.6	0.6
TCE Removal (%)												
East Gate	99.89%	99.91%	99.89%	99.85%	99.89%	99.89%	>99.9%	99.89%	>99.9%	>99.9%	>99.9%	>99.9%
I-5	97.71%	98.09%	97.95%	97.73%	98.00%	98.75%	97.95%	97.76%	98.26%	98.68%	98.46%	98.33%
Flow Rate (gpm)												
East Gate	491	489	495	492	484	478	470	456	422	422	422	417
I-5	1769	1809	1824	1878	1283	1269	1259	1202	1152	1140	1134	1131
TCE Emission (lb/day)												
East Gate	1.59	1.29	1.07	1.18	1.10	1.03	1.07	0.99	1.11	0.96	1.01	0.90
I-5	1.00	1.00	0.94	0.97	0.68	1.08	0.65	0.69	0.63	0.51	0.52	0.48
TCE Emission (lbs/period)												
East Gate	44.56	43.92	31.02	33.06	30.91	36.15	28.95	34.49	30.10	35.62	34.45	25.23
I-5	27.92	34.08	27.40	27.17	19.04	37.95	17.61	24.22	16.90	18.96	17.79	13.47

	Sixth Year of Monitoring											
	Event 63 12/13/2000	Event 64 1/17/2001	Event 65 2/13/2001	Event 66 3/14/2001	Event 67 4/17/2001	Event 68 5/15/2001	Event 69 6/14/2001	Event 70 7/18/2001	Event 71 8/17/2001	Event 72 9/12/2001	Event 73 10/18/2001	Event 74 11/14/2001
Influent TCE (µg/L)												
East Gate	250	210	250	250	360	280	310	280	260	240	230	230
I-5	40	40	44	39	40	39	36	37	40	43	36	41
Effluent TCE (µg/L)												
East Gate	0.2 U	0.2	0.3	0.2	0.2	0.7	1.7	0.9	0.6	0.6	0.6	0.7
I-5	0.5 (0.2 U)	0.8 (0.7)	0.8 (0.7)	0.7 (0.8)	1.1 (0.9)	0.8 (<0.2)	0.6 (0.7)	0.8 (0.6)	0.5 (0.4)	0.6 (0.5)	0.4 (0.4)	0.5 (0.4)
TCE Removal (%)												
East Gate	>99.9%	99.90%	99.88%	99.92%	99.94%	99.75%	99.45%	99.68%	99.77%	99.75%	99.74%	99.70%
I-5	98.75%	98.00%	98.18%	97.95%	97.25%	97.95%	98.06%	97.84%	98.75%	98.84%	98.61%	98.78%
Flow Rate (gpm)												
East Gate	412	426	420	428	404	620	623	561	647	648	643	607
I-5	1586	1677	1704	1712	1735	1715	1677	1630	1494	1469	1427	1432
TCE Emission (lb/day)												
East Gate	1.24	1.07	1.26	1.28	1.75	2.08	2.31	1.88	2.02	1.86	1.77	1.67
I-5	0.75	0.79	0.88	0.79	0.81	0.79	0.71	0.71	0.71	0.75	0.61	0.70
TCE Emission (lbs/period)												
East Gate	27.21	37.59	34.03	37.26	59.40	58.27	69.25	63.98	60.51	48.47	63.82	45.16
I-5	16.56	27.65	23.89	22.79	27.58	22.05	21.28	24.11	21.28	19.46	21.98	18.82

**Table 2**  
**Groundwater Treatment System Performance Data Summary**

	Seventh Year of Monitoring							
	Event 75 12/10/2001	Event 76 1/16/2002	Event 77 2/18/2002	Event 78 3/14/2002	Event 79 4/12/2002	Event 80 5/14/2002		
Influent TCE (µg/L)								
East Gate	190	660	350	360	320	330		
I-5	38	37	35	46	34	40		
Effluent TCE (µg/L)								
East Gate	1.4	0.5	1.5	1.0	0.9	0.9		
I-5	0.4	0.4	0.5	0.6	0.5	0.7		
TCE Removal (%)								
East Gate	99.26%	99.92%	99.57%	99.72%	99.72%	99.73%		
I-5	98.95%	98.92%	98.57%	98.70%	98.53%	98.25%		
Flow Rate (gpm)								
East Gate	598	704	682	678	669	568		
I-5	1493	1662	1597	1584	1576	1571		
TCE Emission (lb/day)								
East Gate	1.36	5.58	2.86	2.93	2.57	2.25		
I-5	0.67	0.73	0.66	0.86	0.63	0.74		
TCE Emission (lbs/period)								
East Gate	35.24	206.46	94.26	70.21	74.40	71.89		
I-5	17.54	27.05	21.85	20.74	18.40	23.74		

**Notes:**

Influent and effluent concentrations for Startup through Event 8 provided by the Treatment System Construction Contractor, MEI, Inc.  
Puguet Sound Clean Air Agency limits for trichloroethene (TCE) emissions: 75 lb/month or 760 lb/yr (I-5); 325 lb/month or 3,700 lb/yr (East Gate)  
State discharge limits for TCE: 5 µg/L  
Design flow rates: 2,000 gpm (I-5), 800 gpm (East Gate)  
Total TCE emission in pounds calculated by multiplying pounds per day of event with number of days since previous sampling.  
**As of 5/14/02, the estimated total TCE removed from the East Gate system is 4,468 lbs**  
**As of 5/14/02, the estimated total TCE removed from the I-5 system is 2,288 lbs**  
**As of 5/14/02, the estimated total TCE removed from both systems is 6,756 lbs**  
"-,-" system offline; no sample collected  
Results in parentheses are for blind duplicate samples.  
µg/L - microgram per liter  
J - estimated value  
R - result rejected  
U - compound not detected above analytical reporting limit

**Table 5**  
**Pre-Startup and Quarterly Sampling Results for Trichloroethene (mg/L)**

Well	Pre-Startup February-95	1st Quarter December-95	2nd Quarter March-96	3rd Quarter June-96	4th Quarter September-96	5th Quarter December-96
<b>Upper Aquifer Wells</b>						
LC-03	1.0 J	0.66 J	0.29 J	0.36 J	0.8	0.46 J
LC-05	80 J	13 J	9.4	35	35	10
LC-06	140 J	37 J	22	18	130	14
LC-14A	78	52 J	40	66	87	60
LC-19A	--	--	--	--	--	--
LC-19B	--	--	--	--	--	--
LC-19C	--	--	--	--	--	--
LC-26	1.2 U	<1.2 JU	<1.2 U	<1.2 U	0.2 J	0.60 J
LC-41A	180 J	150 J	140	140	230	170
LC-44A	59	32 J	43	20	34	23
LC-49	200 J	190 J	200	200	240	250
LC-49A	77	65 J	120	68	110	59
LC-51	110 J	88	110 (110)	120	140	150
LC-53	130 J	100	150	160	190	170
LC-64A	430 J	420	530 (540)	290	320	520
LC-64B	44 J	78	72	55	80	47
LC-66A	36	51 J	77	93	96	120
LC-66B	120	100 J	110	120	140	140
LC-73A	--	1.8 J	0.77 J	0.60 (0.57) J (J)	1.0	1.1 J
LC-108	32 (26)	270	13	23	13	12
LC-111B	<1.2 U	<1.2 (<1.2) U (U)	<1.2 (<1.2) U (U)	<1.2 U	0.3 J	1.4
LC-116B	4.4	0.50 J	0.24 J	0.26 J	0.4	0.28 J
LC-122B	0.64 J	1.2 U	<1.2 U	<1.2 U	<0.3 U	0.39 J
LC-128	17	29 J	19	18	22	18
LC-132	25	21 J	40	38	79	52
LC-134	18,000 J	8,600	3,400	2,200	2,100	3,200
LC-136A	24,000 J	19,000 (20,000)	51,000	46,000	50,000	52,000
LC-136B	220 J	160	130	88	93	56,000 R
LC-137A	580 (120) J (J)	41	34	76	300	27
LC-137B	340 J	170	220	160	110	47
LC-137C	12	5.5	46	41 (42)	34 (34)	26 (21)
LC-144A	21	110 J	94	160	140	43
LC-144B	530 J	120 J	140	140 (150)	200 (190)	180 (180)
LC-149C	<1.2 U	<1.2 U	<1.2 U	<1.2 U	<0.3 U	<1.2 U
LC-149D	<1.2 U	<1.2 U	<1.2 U	<1.2 U	<0.3 U	<1.2 U
LC-162	1000 J	600	1,400	800	550	680
LC-165	--	1.2 J	<1.2 U	<1.2 U	0.2 J	<1.2 U
PA-381	68	45 J	21	27	60	35
PA-383	1.2	1.2	1.4	1.7	1.6 (1.7)	1.8 (1.4) J (none)
T-01	5.5	3.8 (4.0)	2.0	1.7	1.9	2.2
T-04	41 (23)	13	3.5	6.8	16	5.4
T-08	2.6	2.0	2.1	1.9	3.1	2.0
T-12B	--	--	--	--	--	--
T-13B	4.0	4.3	3.8	4.1	4.5	4.4
<b>Lower Aquifer Wells</b>						
LC-21C	--	--	--	--	--	--
LC-26D	<1.2 U	<1.2 J	<1.2 U	<1.2 U	<0.3 U	<1.2 U
LC-35D	--	--	--	--	--	--
LC-40D	19	12 J	14 J	16	18 J	16
LC-41D	110 (120) J (J)	84 J	100	120 (110)	140 (150)	140 (120)
LC-47D	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--
LC-66D	48	36 J	52	47 (40)	62 (55) J (J)	51
LC-67D	45 (47)	56	51	55	44	59
LC-71D	<1.2 U	<1.2 U	<1.2 U	<1.2 U	0.1 J	<1.2 U
LC-72D	51	40 (46)	47	47	48	49
LC-73D	28	23	35 (36) J (J)	30	41 J	31
LC-74D	--	40 J	36	38	81	46
LC-75D	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--
LC-126	110 J	76 J	110	100	130	130
LC-166D	--	<1.2 (<1.2) U (U)	<1.2 (<1.2) U (U)	<1.2 U	0.1 J	<1.2 U
LF4-MW-2C	<1.2 U	1.0 J	<1.2 U	<1.2 U	0.2 J	2.0
<b>Surface Water Stations</b>						
SW-MC-1	<0.3 U	<0.30 U	<0.30 U	<0.30 U	<0.3 U	<0.3 U
SW-MC-2	1.0 J	1.9 (1.9)	4.1 (4.0)	3.2 (3.3)	1.8 (1.9)	1.8 (1.9)
SW-MC-4	--	--	--	--	--	--

**Table 5 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Trichloroethene (mg/L)**

Well	6th Quarter	7th Quarter	8th Quarter	9th Quarter	10th Quarter	11th Quarter	12th Quarter
	March-97	July-97	September-97	December-97	March-98	June-98	September-98
<b>Upper Aquifer Wells</b>							
LC-03	0.39 J	0.28 J	0.8	0.81 J	0.54 J	<1.2 U	1.5
LC-05	7	29	38	32	22	32	44
LC-06	9.6	31	46	47	24	34	120
LC-14A	72	69	63	61	50	47	110
LC-19A	--	--	--	--	--	--	100
LC-19B	--	--	--	--	--	--	120 (130)
LC-19C	--	--	--	--	--	--	2.3
LC-26	<1.2 U	<1.2 U	0.3	0.39 J	0.41 J	0.28 J	<0.2 U
LC-41A	170	210	180	190	160	180	130
LC-44A	19	17	19	12	12	14	20
LC-49	250	230 J	230	240	240	260	270
LC-49A	130	69	97	83	68	89	Discontinued
LC-51	150	130 (140)	140	150	160	150	200
LC-53	180	140	160	140	130	150	210
LC-64A	310	350	280	460	360	750	580
LC-64B	51	45	48	45	42	59	80
LC-66A	120	97	100 J	120	95	96	120
LC-66B	130	130	130	100	92	120	480 R
LC-73A	0.78 J	0.59 J	0.7	0.82 J	0.78 J	0.96 J	<1 U
LC-108	9.1	26	11	45	24	17	11
LC-111B	0.27 J	0.35 J	0.6	0.48 J	<1.2 U	<1.2 U	0.6
LC-116B	0.36 J	<1.2 U	0.4	0.38 J	0.47 J	0.49 J	0.3
LC-122B	<1.2 U	<1.2 U	<0.3 U	<1.2 U	<1.2 U	<1.2 U	<0.2 U
LC-128	21	19	26	21	12	19	24
LC-132	61	55 (54)	66	57	56	61	54
LC-134	890	1,300	1,200	3,700	2,400	2,800	2,800
LC-136A	66,000	80,000	74,000	86,000	71,000	78,000	110,000
LC-136B	78	76	80	69	68	70	98
LC-137A	100	78	130	64	49	100	700
LC-137B	200	120	87	96	46	120	350
LC-137C	12 (13)	10 (11)	19 (19)	22 (20)	10 (9.9)	4.3 (3.5)	9.6 (9.5)
LC-144A	69	150	130	110	54	34	Discont.(See LC-19A,B,C)
LC-144B	170 (170)	170 (180)	150 (160)	140 (140)	160 (140)	140 (140)	Discont.(See LC-19A,B,C)
LC-149C	<1.2 U	<1.2 U	<0.3 U	<1.2 U	<1.2 U	<1.2 U	<0.2 U
LC-149D	<1.2 U	<1.2 U	<0.3 U	<1.2 U	<1.2 U	<1.2 U	0.4
LC-162	720	510	380	400	460	450	290
LC-165	<1.2 U	<1.2 U	<0.3 U	<1.2 U	0.29 J	<1.2 U	0.2
PA-381	32	32	40	38	40	33	58
PA-383	1.4 (1.4)	1.5	1.1 (1.1)	1.4 (1.7)	0.92 (0.92) J (J)	0.92 (1.0) J (J)	<0.2 (0.4) U
T-01	2.0	1.4	1.6	1.5	1.6	1.9	1.7
T-04	7.5	8.4	6.2	2.2	1.5	5.2	15
T-08	2.1	1.9	2.7	2	2.6	2.3	3.7
T-12B	--	--	--	--	--	--	--
T-13B	5.1	3.5	5.0	4.4	4.3	4.6	6.2
<b>Lower Aquifer Wells</b>							
LC-21C	--	--	--	--	--	--	--
LC-26D	<1.2 U	<1.2 U	<0.3 U	<1.2 U	<1.2 U	<1.2 U	<0.2 U
LC-35D	--	--	--	--	--	--	--
LC-40D	20	18	15	16	20	0.49 J	22
LC-41D	130 (130)	130 J	120 (130)	130 (120)	120 (110)	160 (140)	110 (110)
LC-47D	--	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--	--
LC-66D	49 (50)	50 (47)	59 (60)	54 (47)	53 (50)	51 (25)	68 (70)
LC-67D	58	59	50	59	66	47	55
LC-71D	<2.4 U	<1.2 U	<0.3 U	<1.2 U	<1.2 U	<1.2 U	<0.2 U
LC-72D	55	57	52	52	56	53	<1 UR
LC-73D	38	35	30	34	35	21	16
LC-74D	47	48	71	52	49	47	53
LC-75D	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--
LC-126	120	110	120	110	100	110	82
LC-166D	<1.2 U	<1.2 U	0.3	<1.2 U	<1.2 U	0.44 J	0.2
LF4-MW-2C	<1.2 U	<1.2 U	0.3	0.38 J	1 J	1.7	Discontinued
<b>Surface Water Stations</b>							
SW-MC-1	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U
SW-MC-2	2.9 (2.8)	2.2 (2.3)	1.7 (1.6)	1.1 (1.1)	1.0 (1.0)	--	--
SW-MC-4	--	--	--	--	--	1.2 (1.1)	1.4 (1.2)

**Table 5 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Trichloroethene (mg/L)**

Well	13th Quarter December-98	14th Quarter March-99	15th Quarter June-99	16th Quarter September-99	17th Quarter December-99	18th Quarter March-00	19th Quarter June-00
<b>Upper Aquifer Wells</b>							
LC-03	1.0	0.8	0.9 J	1.2	0.9 (0.8)	0.6 (0.7)	0.8 (0.8)
LC-05	18	12 J	22	44	27	11	24
LC-06	67 (58)	9.8	50	120	110	68	140
LC-14A	46	40	58	62	52	58	67
LC-19A	190	220	180 J	170	170	180	170
LC-19B	78	330	180 J	120	73	83	70
LC-19C	53	51	54	46	47	39	42
LC-26	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
LC-41A	170	170	150	190	160	150	160
LC-44A	18	26 J	17 (18)	18 (18)	37	14	42
LC-49	300	250	200 J	170	270	200	220
LC-49A	--	--	--	--	--	--	--
LC-51	140	180	180 J	160	160 J	170	150
LC-53	160	180	200 J	170	230	170	190 J
LC-64A	2,400 J	1100	520 (500)	370 (370)	860 J	390	340
LC-64B	41	56	64	36	18 J	18	18
LC-66A	140	120 (100)	100 (93)	83 (82)	100	110	100
LC-66B	120	160	140 J	120	130	130	110
LC-73A	<0.2 U	1.5 (1.2)	0.9 J	0.8	1.2	1.1	0.9
LC-108	150	6.4	20	0.4	68 J	5.1	24
LC-111B	<0.2 U	0.2	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	0.3	0.3	<0.2 U	0.3	<0.2 U	<0.2 U	0.4
LC-122B	<0.2 U	0.5	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	18	19 (19) J(J)	21	22	31 (26)	26 (24)	21 (21)
LC-132	77	45	80	91	100	83	100
LC-134	2,000 J	1,400	560	2,000	3,700 (4,200) J (J)	2,000 (1,500) J (none)	1,500 (1,400)
LC-136A	91,000 J	120,000	100,000	130,000	180,000	190,000	160,000
LC-136B	160 J	110	100 J	81	100 J	98	90
LC-137A	96 J	38 (36)	95	270	57	61	54
LC-137B	79 J	55	160 J	210	130 (130)	140 (130)	110 (110)
LC-137C	23 (21)	16	0.8 J	8.1	0.3	0.2	<0.2 U
LC-144A	--	--	--	--	--	--	--
LC-144B	--	--	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	0.2 U	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
LC-149D	0.3	<0.2 U	0.2 (0.2) UJ (U)	<0.2 (<0.2) U (U)	<0.2 UJ	<0.2 U	<0.2 U
LC-162	220 J	500	370 J	280	340 J	380	280
LC-165	0.2	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
PA-381	26	42	52	44	56 J	47	66
PA-383	0.8 (0.9)	1.8	2	2.1	1.5	1.4	1.6
T-01	2	1.6	1.6 (1.7)	2.5 (2.3)	--	--	--
T-04	3.2	5.3	8.8	10	12	8.5	12
T-08	2.7	2.5	3.1	3.8	3.0	2.6	2.4
T-12B	--	--	--	--	4.4	<0.2 U	<0.2 U
T-13B	4.9	5.3	5.5	5.3	5.4	4.6	4.8
<b>Lower Aquifer Wells</b>							
LC-21C	0.4	--	4.2	<0.2 U	--	--	--
LC-26D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	0.3	<0.2 U	--	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U
LC-40D	21	16	19	8.5	3.8 J	3.2	8.4
LC-41D	120 (140) (J) (none)	--	130	130	120 (110)	100 (98)	120 (120)
LC-47D	<0.2 U	<0.2 U	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-50D	0.9	--	1.1 J	0.3	8 J	5.1 J	1.4
LC-66D	59 (57)	45 (46)	53	3.4	3.8	3.0	3.2
LC-67D	79	44	66 (66)	50 (50)	53 (50)	48 (52)	53 (52)
LC-71D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.2
LC-72D	63	56	57	49	13	18	16
LC-73D	43	34	36	6.5	5.9	18	23
LC-74D	65	--	63 J	84	71	64	71
LC-75D	--	--	--	--	--	0.7	0.8
LC-76D	--	--	--	--	--	<0.2 U	<0.2 U
LC-77D	--	--	--	--	--	31	11
LC-126	120	140	110	98	87	71	91
LC-166D	<0.2 U	0.8	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	0.2 UJ	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	0.8 (0.8) (J) (none)	4.6 (4.3 )	3.9 (4.0)	3.6 (3.4) J (J)	2.0 (2.0)	1.2 (1.2)	1.5 (1.4)

**Table 5 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Trichloroethene (mg/L)**

Well	20th Quarter	21st Quarter	22nd Quarter	23rd Quarter	24th Quarter
	September-00	December-00	March-01	June-01	September-01
<b>Upper Aquifer Wells</b>					
LC-03	18	2.0	1.5	1.5	2.2
LC-05	48	76	83	41	73
LC-06	100	46	67	74	61
LC-14A	52	50	58	35	46
LC-19A	180	200 J	160	160	170
LC-19B	98	110	86	45	140
LC-19C	53	74	44	62	68
LC-26	<0.2 U	47	0.3	0.3	2.0
LC-41A	180	160 J	190	200	190
LC-44A	27	30	34	28	30
LC-49	230	330 J	240	240	250
LC-49A	--	--	--	--	--
LC-51	160	170	150	150	160
LC-53	210	270 J	220	190	190
LC-64A	250	10	8,600	14,000	19,000
LC-64B	19 (23)	22 (25)	16 (15)	19 (22)	15 (16)
LC-66A	80	83	67	68	62
LC-66B	110	130	110	110	130
LC-73A	0.7	0.9	0.7	0.6	0.8
LC-108	24	4.2	13	16	4.0
LC-111B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	4.1	5.7	14	11	14
LC-122B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	62	22	21	22	27 J
LC-132	91	100	97	99	110
LC-134	2,200 (1,900)	--	--	--	--
LC-136A	190,000	140,000(160,000) J (J)	190,000	190,000 (170,000)	250,000
LC-136B	83	100	110 (110)	92	130 (120)
LC-137A	330	280 J	270	350	410
LC-137B	210 (210)	280 (280) J (J)	250 (250)	320 (300)	310 (300)
LC-137C	0.3	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--	--	--
LC-144B	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-162	230	--	--	--	--
LC-165	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
PA-381	35	43	46 J	36	35
PA-383	1.0	1.1	0.8	0.8	1.0
T-01	--	--	--	--	--
T-04	8.3	8.0	12	8.8	8.8
T-08	2.2	2.9	2.4	1.9	2.5
T-12B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-13B	3.7 (3.8)	4.8 (5.0)	4.2 (4.3 )	4.0 (4.1)	3.9 (3.8)
<b>Lower Aquifer Wells</b>					
LC-21C	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-40D	2.3	2.1	13	14	13
LC-41D	120 (160)	130 (130)	110 (120)	130 (140)	120 J
LC-47D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-50D	2.5	6.6	6.3	2.9 U	7.9
LC-66D	3.3	2.2	42	30	24
LC-67D	54 (54)	50 (54)	70 (65)	50 (50)	47 (50)
LC-71D	0.4	0.4	<0.2 U	<0.2 U	<0.2 U
LC-72D	11	9.5	36 J	40 J	35
LC-73D	6.5	6.3	28	16	20
LC-74D	64	73	64 J	58	65
LC-75D	1.0	0.9	1.1 J	0.7	0.8
LC-76D	<0.2 U	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U
LC-77D	8.2	5.1	6.2 J	4.4	4.1
LC-126	79	86	88	76	83
LC-166D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--
<b>Surface Water Stations</b>					
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	1.0 (1.0)	0.7 (0.8)	0.6 (0.6)	0.5 (0.5)	<0.2 (<0.2) U (U)

**Notes:**

J - estimated value

R - result rejected

U - compound not detected

-- Well not sampled

Value with a "less than" symbol (<) indicates the compound was not detected at the listed detection limit.

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses; all other results are for EPA Method 8010 analyses.

**Table 5 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Trichloroethene (ug/L)**

Well	25th Quarter December 2001	26th Quarter March 2002
<b>Wells Screened in Upper Aquifer</b>		
FL-2	NS	330 (300)
FL-3	6.1 (5.9)	5.7
FL-4A	5.1	1.2
FL-4B	0.3	0.3
FL-6	3.4	2.8
LC-03	1.1	0.8
LC-05	NS	21
LC-06	NS	32
LC-14A	NS	64
LC-16	9.3 J	5.3
LC-19A	170	190
LC-20	0.2 U	0.2 U
LC-24	0.6	1.3
LC-26	NS	0.4
LC-34	1.7	1.5
LC-41A	NS	140
LC-41B	130	110
LC-49	NS	220
LC-53	NS	230
LC-57	0.2 UJ	5.3
LC-61B	2.0	2.1
LC-64A	28,000 (29,000)	12,000
LC-64B	NS	12 (12)
LC-66B	NS	88
LC-111B	NS	0.4
LC-116B	NS	11
LC-122B	NS	0.2 U
LC-128	NS	20
LC-136A	220,000	150,000
LC-136B	NS	110 (100)
LC-137B	210 (220)	160 (160)
LC-137C	NS	0.2
LC-149C	NS	0.2 U
LC-167	0.2 U	0.2 U
MAMC-1	3.1	2.6
MAMC-6	2.0	2.1
PA-381	NS	43
PA-383	NS	1.2
T-04	NS	8.5
T-06	7.0 J	6.0
T-08	NS	2.2
T-10	NS	0.2 U
T-11B	NS	8.2
T-12B	0.2 U	0.2 U
T-13B	NS	4.1 (4.5)
<b>Wells Screened in Lower Aquifer</b>		
LC-21C	NS	0.2 U
LC-26D	NS	0.2 U
LC-35D	0.2 U	0.2 U
LC-40D	NS	13
LC-47D	1.5	0.2 U
LC-50D	7.5	2.7
LC-66D	NS	28
LC-67D	NS	47 (43)
LC-69D	150	120
LC-70D	0.2 U	0.3
LC-71D	NS	0.3
LC-72D	NS	33
LC-73D	NS	15
LC-74D	NS	62
LC-75D	0.8	0.9
LC-76D	0.2 U	0.2 U
LC-77D	3.8	4.4
LC-126	NS	80 (75)
MAMC-3	2.6	2.7
MAMC-4	0.2 (0.2) U(U)	0.2 U
PS-13	0.5	0.4
<b>Surface Water Stations</b>		
SW-MC-1	NS	0.2 U
SW-MC-4	0.6 (0.8)	1.1 (1.2)
SW-MC-6	1.0	1.8

**Notes:**

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses;

all other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 6**  
**Pre-Startup and Quarterly Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	Pre-Startup February-95	1st Quarter December-95	2nd Quarter March-96	3rd Quarter June-96	4th Quarter September-96	5th Quarter December-96	6th Quarter March-97	7th Quarter July-97
<b>Upper Aquifer Wells</b>								
LC-03	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-05	9.2	0.58 J	0.21 J	3.6	3.7	0.28 J	0.34 J	2.3
LC-06	31	5.8	2.0	1.4	26	0.83 J	0.4 J	4.9
LC-14A	9.7	6.7	3.9	7.9	8.3	6.0	8.1	5.5
LC-19A	--	--	--	--	--	--	--	--
LC-19B	--	--	--	--	--	--	--	--
LC-19C	--	--	--	--	--	--	--	--
LC-26	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-41A	18	9.1 J	8.6 J	6.8	11	7.8	8.0	10
LC-44A	10	6.2	6.2	1.2	2.4	2.5	1.2	0.59 J
LC-49	42	46	42	45	48	54	53	47 J
LC-49A	39 J	50	37	38	74	21	27	42
LC-51	24	25	29 (30)	29	35	50	50	52 (55)
LC-53	56	62	76	73	91	80	80	87
LC-64A	36 J	37	24 (25)	15	16	18	13	8.8 J
LC-64B	2.3	3.8	2.6	2.3	3.9	2.6	2.4	1.6 J
LC-66A	5.2	7.0	11.0	11	9.8	9.0	9.2	5.6
LC-66B	12	11	10 J	11	12	12	11	9.9
LC-73A	NA	<1.0 U	<1.0 U	<1.0 (<1.0) U (U)	0.1 J	<1.0 U	<1.0 U	<1.0 U
LC-108	23 (23)	28	1.4	2.1	1.6	0.88 J	0.58 J	4.1
LC-111B	<1.0 U	<1.0 (<1.0) U (U)	<1.0 (<1.0) UJ (UJ)	<1.0 U	0.7	0.89 J	1.2	1.3
LC-116B	2.0	<1.0 U	<1.0 UJ	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-122B	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-128	<1.0 U	2.9	1.5	1.5	2.3	1.4	2.6	1.8
LC-132	4.4	5.0	4.8	3.9	6.6	4.9	5.2	3.4 (4.6)
LC-134	2,000 J	1,100	450	290	490	510	200	220
LC-136A	300	150 (140) J (J)	200 J	<1,000 U	230 J	410 J	420 J	<2,000 U
LC-136B	30	51	35	25	25	<1,000 U	22	22
LC-137A	40 (39)	4.9	3.6	5.1	43	2.2	8.0	7.3
LC-137B	30	18	23	12	7.7	3.0	14	7.2
LC-137C	0.93 J	0.79 J	19	9.7 (10)	8.0 (8.2)	6.3 (5.0)	2.8 (2.9)	2.0 (2.4)
LC-144A	3.0	24	14	22	21	4.8	8.4	24
LC-144B	29	26	25	19 (24)	23 (23)	28 (28)	24 (26)	27 (29)
LC-149C	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-149D	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-162	910 J	620	1,000	790	670	640	570	500
LC-165	NA	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
PA-381	3.3	1.9	0.67 J	0.86 J	1.8	0.90 J	1.1	0.65 J
PA-383	<1.0 U	<1.0 U	<1.0 U	0.20 J	0.1 (0.2) J (J)	<2.0 (<1.0) U (U)	0.2 (<1.0) J (U)	<1.0 U
T-01	0.42 J	0.26 (<1.0) J (U)	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
T-04	5.3 (2.6)	1.3	<1.0 U	0.42 J	1.6	0.26 J	0.79 J	0.52 J
T-08	<1.0 U	<1.0 U	<1.0 U	<1.0 U	0.2 J	<1.0 U	0.22 J	<1.0 U
T-12B	--	--	--	--	--	--	--	--
T-13B	4.5	3.8	3.6	3.8	4.6	3.4	4.7	3.5
<b>Lower Aquifer Wells</b>								
LC-21C	--	--	--	--	--	--	--	--
LC-26D	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LC-35D	--	--	--	--	--	--	--	--
LC-40D	3.4	1.7	2.0	2.1	2.8	2.5	2.9	2.6
LC-41D	8.6 (8.0)	5.3	4.6 J	5.0 (3.7) (J)	6.3 (6.1)	5.4 (6.1)	5.1 (5.3)	4.2 J
LC-47D	--	--	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--	--	--
LC-66D	4.7	3.9	4.9	3.4 (3.5)	5.2 (5.0)	4.8	4.4 (4.4)	3.8 (3.6)
LC-67D	18 (19)	17	17	17	18	18	18	19
LC-71D	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<0.5 U	<1.0 U	<2.0 U	<1.0 U
LC-72D	7.0	5.8	5.1	4.3	5.2	5.1	5.7	4.9
LC-73D	4.4	2.4	3.3 (3.3)	2.8	3.6	3.3	3.8	2.7
LC-74D	--	5.0	3.9	3.5	6.6	4.6	4.5	4
LC-75D	--	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--	--
LC-126	12	8.7	10	9.2	12	13	13	8.9
LC-166D	--	<1.0 (<1.0) U (U)	<1.0 (<2.0) U (U)	<1.0 U	<0.5 U	<1.0 U	<1.0 U	<1.0 U
LF4-MW-2C	<1.0 U	<1.0 UJ	<1.0 U	<1.0 U	0.2 J	<1.0 U	<1.0 U	<1.0 U
<b>Surface Water Stations</b>								
SW-MC-1	0.3 J	<0.50 U	<0.50 U	<0.50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
SW-MC-2	<1.0 J	0.86 (0.88)	3.0 (2.8)	2.1 (2.2)	0.8 (0.8)	0.7 (0.7)	2.1 (2.0)	1.3 (1.4)

**Table 6 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	8th Quarter September-97	9th Quarter December-97	10th Quarter March-98	11th Quarter June-98	12th Quarter September-98	13th Quarter December-98	14th Quarter March-99
<b>Upper Aquifer Wells</b>							
LC-03	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-05	4.2	2.8	2	3.6	4.9	1.5	1.0 J
LC-06	9.4	6.9	3.6	7	21	7.7 (7.4)	<1 U
LC-14A	6.1	4	5	5	11	3.1	2.7
LC-19A	--	--	--	--	12	13	12
LC-19B	--	--	--	--	14 (16)	11	45
LC-19C	--	--	--	--	<1 U	5.2	5.4
LC-26	<0.5 U	<1.0 U	<1.0 U	<1.0 U	0.2 U	<0.2 U	<0.2 U
LC-41A	7.9	5.3	8	7.1	5.3	5.6	4.6
LC-44A	0.9	0.59 J	0.78	<1.0 U	<1 U	2.3	2.8 J
LC-49	48	46	58	70	55	59	44
LC-49A	78	66	62	49	Discontinued	--	--
LC-51	57	62	70	82	97	78	99
LC-53	81	59	86	83	47	28	28
LC-64A	12	16	6.2	14 J	12	68	17
LC-64B	2.5	3.2	2.8	4	16	2.4	3.0
LC-66A	8.3	5.9	4.9 J	7.7	5	5.3	2.9 (2.6)
LC-66B	9.9	8.5	6.7	6.8	26	6.2	5.6
LC-73A	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<1 U	<0.2 U	<0.2 (<0.2) U (U)
LC-108	1.1	6.8	2.9	3.4	<1 U	26	0.2
LC-111B	1.6	1.8	2.4	2.8	1.9	3.7	1.2
LC-116B	<0.5 U	<1.0 U	0.26 J	0.82 J	1.4	1.2	1.3
LC-122B	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-128	3.1	2.7	1.5	1.6	2.4	1.6	1.4 (1.8) J(J)
LC-132	4.7	4.3	3.8	3.2	3.9	2.6	1.2
LC-134	280	570	340	640	580	440	270
LC-136A	570	1,100	620	1,600	1,400	1,400	1,800
LC-136B	21	19	21	19	20	42	21
LC-137A	16	7.5	3.8	10	29	6.8	1.6 (1.8)
LC-137B	7.3	9	2.2 J	10	25	4.6	2.4
LC-137C	4.7 (4.6)	4.3 (4.3)	2.3 (2.1)	11 (11)	11 (10)	4 (4.5)	2.8
LC-144A	27	15	5	5	Discont.(See LC-19A,B,C)	--	--
LC-144B	27 (29)	21 (20)	24 (24)	30 (30)	Discont.(See LC-19A,B,C)	--	--
LC-149C	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-162	310	310	420	460	200	200	330
LC-165	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
PA-381	1.3	1.5	1.7	1	2.4	1	0.2
PA-383	<0.5 (0.5) U (U)	<1.0 (<1.0) U (U)	<1.0 (<1.0) U (U)	<1.0 (<1.0) U (U)	<0.2 (0.3) U	<0.2 (<0.2) U U	0.2
T-01	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
T-04	0.6	<1.0 U	<1.0 U	0.39 J	1.1	0.3	0.3
T-08	0.2 J	<1.0 U	0.28 J	<1.0 U	0.2 J	<0.2 U	0.2
T-12B	--	--	--	--	--	--	--
T-13B	4.3	2.9	2.9	3.2	5.3	3.3	3.8
<b>Lower Aquifer Wells</b>							
LC-21C	--	--	--	--	--	<0.2 U	NA
LC-26D	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	--	--	--	--	<0.2 U	<0.2 U
LC-40D	2.7	2.9	2.8	<1.0 U	3.4	3.2	2.4
LC-41D	5.4 (5.3)	6.0 (5.2)	4.7 (4.5) J (J)	6.4 (5.8)	3.7 (3.4)	3.5 (4)	NA
LC-47D	--	--	--	--	--	<0.2 U	<0.2 U
LC-50D	--	--	--	--	--	<0.2 U	NA
LC-66D	5.8 (5.9)	3.5 (4.2)	4.2 (4.0)	5.8 (2.6)	5.9 (5.8)	4.4	3.5 (3.7)
LC-67D	21	16	19	21	21	18	17
LC-71D	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	5.8	3.6	5.5	6	<1 U R	5.0	4.3
LC-73D	2.6	2.4	2.9	1.6	1.4	2.7	2.2
LC-74D	4.8	4.2	3.4	2.2	3	3.1	--
LC-75D	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--
LC-126	12	10	11	12	4.9	12	13
LC-166D	<0.5 U	<1.0 U	<1.0 U	<1.0 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	0.2 J	<1.0 U	<1.0 U	<1.0 U	Discontinued	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2	0.7 (0.7)	0.2 (<0.5) J (U)	0.2 (0.2) J (J)	<0.5 (<0.5) U	<0.2 U	<0.2 (<0.2) U (UJ)	1.3 (1.2)

**Table 6 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	15th Quarter June-99	16th Quarter September-99	17th Quarter December-99	18th Quarter March-00	19th Quarter June-00	20th Quarter September-00	21st Quarter December-00
<b>Upper Aquifer Wells</b>							
LC-03	<0.2 U	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<1.0 U	<0.2 U
LC-05	2.0	3.7	2.1	1.4	1.8	4.2	6.1
LC-06	10	14	11	16	12	8.2	3.8
LC-14A	4.7	3.9	2.7	1.8	1.6	1.6	1.8
LC-19A	16	12	11	12	9.1	9.6	9.9
LC-19B	34	13	9	8.3	5.6	7.4	7.6
LC-19C	7.1	4.9	5.6	4.3	4.2	4.5	4.9
LC-26	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.6 J
LC-41A	4.1	5.3	2.5	2.2	2.3	3.2	5
LC-44A	2.0 (1.8)	1.7 (1.7)	3.7	2.9	5.5	3.0	3.2
LC-49	50	39	42	40	42	48	61
LC-49A	--	--	--	--	--	--	--
LC-51	110	87	92	81	54	42	33
LC-53	40	27	38	34	33	34	38
LC-64A	15 (16)	18 (19)	73	20	17	20	0.7
LC-64B	2.5	1.9	1	<1 U	<1 U	1.1 (1.3)	1.1 (1.3)
LC-66A	2.8 (2.4)	2.3 (2.5)	2.6	2.8	2.1	2.3	2
LC-66B	6.0	4.4	3.8	3.6	3.0	3.0	2.9
LC-73A	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-108	6.4	<0.2 U	14	<1.0 U	4.8	<1.0 U	0.8
LC-111B	6.3 J	8.9	9.5	7.5	9.2	7.3	8.8
LC-116B	3.2	5.0	3.5	2.8	4.7	2.2	2.5
LC-122B	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	2.5	2.2	3.1 (2.4)	2.1 (2.0)	1.5 (1.5)	2.1	1.6 J
LC-132	3.2	2.4	2.6	2	2.1	2.3	2.9
LC-134	190	460	890 (1000)	480 (390)	380 (350)	570 (480)	--
LC-136A	2,500	3,000	4,500	4,500	4,400	6,400	5,400 (5,700)
LC-136B	18	13	21	15	14	12	20
LC-137A	5.5	26	4.7	3.3	3.6	21	11
LC-137B	7.8	18	7.9 (7.9)	6.0 (5.3)	4.6 (4.7)	13 (14)	11 (10)
LC-137C	<0.2 U	1.1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--	--	--	--	--
LC-144B	--	--	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-162	390	330	380	270	250	260	--
LC-165	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
PA-381	1.6	1.0	1.1	0.9 J	<1 U	0.7	<1 U
PA-383	0.2	0.7	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-01	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	--	--	--	--	--
T-04	1.0	<1 U	0.9	0.6	0.9	0.5	0.6
T-08	0.3	0.2	0.3	0.3	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-13B	4.1	4.4	4.2	4.3	3.8	2.9 (3.0)	3.5 (3.7)
<b>Lower Aquifer Wells</b>							
LC-21C	<0.2 U	<0.2 U	--	--	--	--	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-40D	3.1	2.3	1.5	1.5	1.9	1.2	1.3
LC-41D	4.1	3.2	3.3 (2.9)	2.4 (2.4)	2.3 (2.3)	2.2 (10) (U)	2.3 (2.3)
LC-47D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.3	0.8
LC-66D	4.2	<1 U	0.2	<0.2 U	<0.2 U	0.2	<0.2 U
LC-67D	16 (16)	19 (19)	20 (20)	19 (19)	18 (18)	19(19)	21 (20)
LC-71D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	4.8	4.4	0.7	1.3	1.0	0.5	0.5
LC-73D	2.4	<1 U	0.4	1.2	1.0	0.2	0.2
LC-74D	2.6	4.2	3.6	2.7	2.3	2.9	3.4
LC-75D	--	--	--	<0.2 U	<0.2 U	<1.0 U	0.2
LC-76D	--	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
LC-77D	--	--	--	3.5	1.5	0.9	0.4
LC-126	13	12	12	10	11	11	12
LC-166D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	1.0 (1.0)	0.3 (0.4)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 6 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	22nd Quarter	23rd Quarter	24th Quarter
	March-01	June-01	September-01
<b>Upper Aquifer Wells</b>			
LC-03	<0.2 U	<0.2 U	<0.2 U
LC-05	5.6	2.6	4.5
LC-06	5.8	5.6	3.7
LC-14A	2	1.2	1.2
LC-19A	8.6	9.2	12
LC-19B	6.8	2.9	8.5
LC-19C	3.6	4.5	5.4
LC-26	<0.2 U	<0.2 U	<0.2 U
LC-41A	3.9	3.2	3
LC-44A	3	2	0.9
LC-49	42	40	37
LC-49A	--	--	--
LC-51	25	18	16
LC-53	36	35	38
LC-64A	56 J	110	570
LC-64B	1 (1)	1.0 (1.3)	0.8 (0.9)
LC-66A	1.7	1.7	1.7
LC-66B	2.7	2.0	1.6
LC-73A	<0.2 U	<0.2 U	<0.2 U
LC-108	1.1	0.6	1
LC-111B	8.3	7.2	7.2
LC-116B	2.8	2.8	2.5
LC-122B	<0.2 U	<0.2 U	<0.2 U
LC-128	1.2	1.2	1.2 J
LC-132	2.4	2.4	2.3
LC-134	--	--	--
LC-136A	8,600	9,100 (9,800)	11,000
LC-136B	16 (17)	11	29 (27)
LC-137A	11	49	14
LC-137B	10 (9)	43 (41)	9.8 (9.0)
LC-137C	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--
LC-144B	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 U	<0.2 U	<0.2 U
LC-162	--	--	--
LC-165	<0.2 U	<0.2 U	<0.2 U
PA-381	1	<1 U	0.8
PA-383	<0.2 U	<0.2 U	<0.2 U
T-01	--	--	--
T-04	0.8	0.7	0.5
T-08	<0.2 U	<0.2 U	0.3
T-12B	<0.2 U	<0.2 U	<0.2 U
T-13B	3.6 (3.6)	3.1 (3.2)	3.0 (3.2)
<b>Lower Aquifer Wells</b>			
LC-21C	<0.2 U	<0.2 U	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U
LC-35D	<0.2 U	<0.2 U	<0.2 U
LC-40D	3.1	3.4	3.3
LC-41D	2.3 (2.4)	2.4 (2.4)	1.7 (1.8)
LC-47D	<0.2 U	<0.2 U	<0.2 U
LC-50D	0.8	0.6	3.7
LC-66D	2.8	2	2.0
LC-67D	25 (26)	16 (16)	14 (14)
LC-71D	<0.2 U	<0.2 U	<0.2 U
LC-72D	3	2.9	2.8
LC-73D	1.5	0.9	1.0
LC-74D	2.9	2.5	2.2
LC-75D	<1.0 U	0.2	0.2
LC-76D	<0.2 U	<0.2 U	<0.2 U
LC-77D	<1.0 U	0.3	0.3
LC-126	13	11	11
LC-166D	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--
<b>Surface Water Stations</b>			
SW-MC-1	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 (<0.2) U (U)

**Notes:**

J - estimated value

R - result rejected

U - compound not detected

-- Well not sampled

Value with a "less than" symbol (<) indicates the compound was not detected at the listed detection limit.

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses; all other results are for EPA Method 8010 analyses.

**Table 6 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for cis-1,2-Dichloroethene (ug/L)**

Well	25th Quarter	26th Quarter
	December 2001	March 2002
<b>Wells Screened in Upper Aquifer</b>		
FL-2	NS	270 (380)
FL-3	0.2 (0.2) U (U)	0.2
FL-4A	1.0 J	0.7
FL-4B	0.2 U	0.2
FL-6	0.2 U	0.4
LC-03	0.2 U	0.2 U
LC-05	NS	1.1
LC-06	NS	4.0
LC-14A	NS	1.9
LC-16	0.5	0.3
LC-19A	11	13
LC-20	0.2 U	0.2 U
LC-24	0.2 U	0.2 U
LC-26	NS	0.2 U
LC-34	6.0	4.2
LC-41A	NS	4.0 U
LC-41B	10 U	2.0 U
LC-49	NS	37
LC-53	NS	74
LC-57	0.2 UJ	3.0
LC-61B	0.2 U	0.2 U
LC-64A	1,800 (1,900)	770
LC-64B	NS	0.8 (0.8)
LC-66B	NS	1.6
LC-111B	NS	7.6
LC-116B	NS	2.1
LC-122B	NS	0.2 U
LC-128	NS	1.2
LC-136A	18,000	15,000
LC-136B	NS	21 (25)
LC-137B	6.1 (6.6)	11 (11)
LC-137C	NS	0.2 U
LC-149C	NS	0.2 U
LC-167	0.2 U	0.2 U
MAMC-1	0.2 U	0.2 (0.2) U (U)
MAMC-6	0.2 U	0.2
PA-381	NS	1.0 U
PA-383	NS	0.3
T-04	NS	0.6
T-06	0.4 J	0.3
T-08	NS	0.2
T-10	NS	0.2 U
T-11B	NS	0.3
T-12B	0.2 U	0.2 U
T-13B	NS	3.3 (3.4)
<b>Wells Screened in Lower Aquifer</b>		
LC-21C	NS	0.2 U
LC-26D	NS	0.2 U
LC-35D	0.2 U	0.2 U
LC-40D	NS	3.6
LC-47D	0.2 U	0.2 U
LC-50D	0.7	0.2
LC-66D	NS	2.2
LC-67D	NS	16 (16)
LC-69D	10 U	2.1
LC-70D	0.2 U	0.2 U
LC-71D	NS	0.2 U
LC-72D	NS	3.1
LC-73D	NS	1.0
LC-74D	NS	2.1
LC-75D	0.2	0.2 U
LC-76D	0.2 U	0.2 U
LC-77D	0.3	0.3
LC-126	NS	12 (12)
MAMC-3	0.2 U	0.2
MAMC-4	0.2 (0.2) U (U)	0.2 U
PS-13	0.2 U	0.2 U
<b>Surface Water Stations</b>		
SW-MC-1	NS	0.2 U
SW-MC-4	0.2 (0.2) U (U)	1.7 (1.8)
SW-MC-6	0.2 U	2.8

**Notes:**

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses;

all other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 7**  
**Pre-Startup and Quarterly Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	Pre-Startup February-95	1st Quarter December-95	2nd Quarter March-96	3rd Quarter June-96	4th Quarter September-96	5th Quarter December-96	6th Quarter March-97	7th Quarter July-97
<b>Upper Aquifer Wells</b>								
LC-03	0.14 U	<0.30 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-05	13	0.97 J	1.5	3.3	8.3	0.86	0.81	1.6
LC-06	0.51	0.10 J	<0.30 U	<0.30 U	0.4 J	<0.30 U	<0.3 U	<0.3 U
LC-14A	0.85 U	0.42	0.34	0.22 J	0.2 J	<0.60 U	<0.6 U	<0.6 U
LC-19A	--	--	--	--	--	--	--	--
LC-19B	--	--	--	--	--	--	--	--
LC-19C	--	--	--	--	--	--	--	--
LC-26	<0.3 U	<0.30 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-41A	1.2	<3.0 U	<1.5 U	0.42 J	0.8	1.8	2.5	<1.5 U
LC-44A	0.33 U	0.094 J	0.34	<0.30 U	<0.4 U	0.38	<0.3 U	<0.3 U
LC-49	3.3	3.1 J	2.0 J	2.4 J	2.2	4.8	5.4	1.6 J
LC-49A	0.32 U	<0.60 U	<1.5 U	<1.5 U	<0.8 U	<0.60 U	0.79	<0.6 U
LC-51	0.34	0.19 J	<1.5 (<1.5) U (U)	<1.5 U	0.2 J	1.9	<1.5 U	<1.5 (<1.5) U (U)
LC-53	0.58	0.25 J	<1.5 U	0.7 J	0.5 J	2.4	<1.5 U	<1.5 U
LC-64A	6.3	<3.0 U	<3.0 (<3.0) U (U)	<3.0 U	<2.0 U	<3.0 U	<3.0 U	<3.0 U
LC-64B	0.16 J	<0.60 U	<0.6 U	<0.60 U	<0.4 U	<0.60 U	<0.6 U	<0.6 U
LC-66A	0.22 U	0.24 J	0.21 J	0.29 J	0.3 J	<1.5 U	<1.5 U	<1.5 U
LC-66B	0.77 U	0.49 J	<1.5 U	<1.5 U	0.4 J	1.5	<1.5 U	<1.5 U
LC-73A	NA	<0.30 J	<0.30 U	<0.30 (0.30) U (U)	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-108	<0.30 (0.48) U (none)	<3.0 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-111B	0.36	0.2 (<0.20) J (U)	0.33 (0.31)	0.45	0.6	0.62	0.83	0.45
LC-116B	0.36	<0.30 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	0.3 U
LC-122B	0.47	<0.30 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-128	0.47	0.26 J	0.32	0.14 J	0.2 J	0.41	0.46	0.084 J
LC-132	0.41 U	0.16 J	0.58	0.21 J	0.4	0.63	0.8	<0.6 (0.093) U (J)
LC-134	520 J	190	55	44	94	120	31	33
LC-136A	11	<150 (<150) U (U)	<150 U	<300 U	<200 U	<300 U	<300 U	<600 U
LC-136B	2.4	<1.5 U	<1.5 U	<1.5 U	<0.4 U	<300 U	<0.6 U	<0.6 U
LC-137A	3.1 (3.1)	<0.30 U	<0.30 U	<0.60 U	<0.8 U	<0.30 U	<0.6 U	<0.6 U
LC-137B	1.8	0.4 J	<1.5 U	<1.5 U	<0.8 U	<0.60 U	<1.5 U	<1.5 U
LC-137C	<0.30 U	<0.30 U	0.10 J	<0.60 (<0.60) U (U)	<0.4 (<0.4) U (U)	<0.30 (<0.30) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)
LC-144A	0.13 J	0.78 J	<1.5 U	0.77 J	0.4 J	0.69	<0.6 U	<1.5 U
LC-144B	1.4	1.1 J	0.63 J	0.72 (0.72) J (J)	0.7 (0.7) J (J)	2.5 (2.4)	1.5 (<1.5) (U)	0.43 (0.51) J (J)
LC-149C	<0.30 U	<0.3 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-149D	<0.30 U	<0.3 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LC-162	29	3.7 J	35	4.5 J	1.3	7.3	14	<6.0 U
LC-165	NA	<0.30 U	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
PA-381	0.11 U	<0.30 J	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.30 U
PA-383	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.4 (<0.4) U (U)	<0.60 (<0.30) U (U)	<0.3 (<0.3) U (U)	<0.3 U
T-01	0.36 U	<0.30 (<0.30) U (U)	<0.30 U	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
T-04	11 (6.2)	3.2	0.21 J	0.67	2.6	0.74	0.63	0.58
T-08	0.46 U	0.24 J	0.39	0.11 J	0.3 J	0.55	0.53	<0.3 U
T-12B	--	--	--	--	--	--	--	--
T-13B	3.0	2.9	2.8	2.2	2.8	2.8	3.6	2.4
<b>Lower Aquifer Wells</b>								
LC-21C	--	--	--	--	--	--	--	--
LC-26D	<0.3 U	<0.30 U	<0.30 U	<0.30 U	<0.4 U	0.73 UJ	<0.3 U	<0.3 U
LC-35D	--	--	--	--	--	--	--	--
LC-40D	0.26 J	0.13 J	0.12 J	0.14 J	0.2 J	0.80 UJ	0.44	0.12 J
LC-41D	0.58 (0.52)	0.26 J	<1.5 U	<1.5 (<1.5) U (U)	0.4 (0.4) J (J)	2.1 (0.92)	1.6 (1.8)	<1.5 UJ
LC-47D	--	--	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--	--	--
LC-66D	0.36	0.23 J	0.24 J	0.17 (0.19) J (J)	0.3 (0.3) J (J)	1.7 UJ	0.67 (<0.6) (U)	<0.6 (<0.6) U (U)
LC-67D	0.86 (0.83)	0.65	0.44 J	0.51 J	0.5	2.1 UJ	0.89	0.58
LC-71D	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.4 U	0.50 UJ	<0.6 U	<0.3 U
LC-72D	0.55	0.29 J	<0.30 U	0.26 J	0.4 J	1.7 UJ	0.8	<0.6 U
LC-73D	0.33	0.21 J	0.17 (0.19) J (J)	0.18 J	0.2 J	0.75 UJ	0.52	0.16 J
LC-74D	--	0.32 J	0.20 J	0.23 J	0.4 J	0.57	0.56	0.19 J
LC-75D	--	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--	--
LC-126	2.7	4.0	3.9	4.2	5.4	7.3	6.4	3.2
LC-166D	NA	<0.30 (<0.30) U (U)	<0.30 (<0.60) U (U)	<0.30 U	<0.4 U	<0.30 U	<0.3 U	<0.3 U
LF4-MW-2C	0.30 J	<0.30 U	<0.30 U	<0.30 U	<0.4 U	0.20 J	<0.3 U	<0.3 U
<b>Surface Water Stations</b>								
SW-MC-1	<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
SW-MC-2	<0.40 U	<0.40 (<0.40) U (U)	<0.40 (<0.40) U (U)	<0.1 (<0.1) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)

**Table 7 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	8th Quarter September-97	9th Quarter December-97	10th Quarter March-98	11th Quarter June-98	12th Quarter September-98	13th Quarter December-98	14th Quarter March-99
<b>Upper Aquifer Wells</b>							
LC-03	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-05	5.4	3	1.5	1.9	7.9	<1 U	<1 U
LC-06	<0.4 U	0.24 J	0.11 J	0.2 J	<1 U	<1 (<1) U (U)	<1 U
LC-14A	<0.4 U	0.21 J	<0.6 U	<0.6 U	2.4	2.5	<1 U
LC-19A	--	--	--	--	<1 U	<1 U	<1 U
LC-19B	--	--	--	--	<1 (<1) U (U)	<1 U	<3 U
LC-19C	--	--	--	--	26	<0.2 U	<1 U
LC-26	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-41A	<0.4 U	1.1 J	1.1 J	0.93 J	<1 U	<1 U	<1 U
LC-44A	<0.4 U	<0.3 U	0.081 J	<0.3 U	<1 U	<1 U	<1 U
LC-49	2.6	3.3	3.1	3.9	1.8	<3 U	<3 U
LC-49A	<0.4 U	0.35 J	0.3 J	0.27 J	Discontinued	--	--
LC-51	0.4	0.61 J	0.51 J	0.7 J	<1 U	<1 U	<1 U
LC-53	<2.0 U	0.72 J	0.77 J	0.7 J	<1 U	<3 U	<3 U
LC-64A	<2.0 U	0.81 J	<1.5 U	<4.0 U	<3 U	<5 U	<10 U
LC-64B	0.4 J	<0.6 U	<0.6 U	<0.6 U	<1 U	<1 U	<1 U
LC-66A	<0.4 U	0.54 J	<1.5 U	<1.5 U	<1 U	<1 U	<1 (<1) U (U)
LC-66B	0.2 J	0.54 J	0.56 J	0.66 J	<1 U	<5 U	<1 U
LC-73A	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<1 U	<0.2 U	<0.2 (<0.2) U (U)
LC-108	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<1 U	<1 U	<0.2 U
LC-111B	0.5 J	0.46	0.66	0.62	0.8	0.5	0.2
LC-116B	<0.4 U	0.11 J	0.17 J	0.23 J	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-128	0.2 J	0.26 J	0.17 J	0.2 J	<1 U	<1 U	1 (1) U (U)
LC-132	0.4 U	0.47 J	0.34 J	0.41 J	<1 U	<1 U	<1 U
LC-134	44	140	68	120	68	35	30 U
LC-136A	<200 U	110	<600 U	600	100 U	<900 U	<1000 U
LC-136B	<0.4 U	0.29 J	<1.8 J	0.39 J	<1 U	<1 U	<1 U
LC-137A	<0.8 U	0.2 J	<0.6 U	0.2 J	<15 U	<1 U	<1 (<1) U (U)
LC-137B	<0.4 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 U
LC-137C	<0.4 (<0.4) U (U)	0.1 (0.13) J (J)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	<1 (<1) U (U)	<1 (<0.2) U (U)	<1 U
LC-144A	0.4	0.47 J	<3.0 U	<1.5 U	Discont.(See LC-19A,B,C)	--	--
LC-144B	0.7 (0.7)	0.84 (0.46) J (J)	0.87 (0.85) J (J)	1.4 (1.4) J (J)	Discont.(See LC-19A,B,C)	--	--
LC-149C	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-162	<2.0 U	2 J	2.6 J	6.4	<3 U	<2 U	<3 U
LC-165	<0.4 U	0.1 J	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
PA-381	<0.4 U	0.13 J	0.12 J	<0.3 U	<1 U	<1 U	<1 U
PA-383	<0.4 (<0.4) U (U)	<0.3 (0.080) U (J)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	0.2 (0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U
T-01	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
T-04	0.6	0.2 J	0.14 J	0.51	<1 U	0.2	<0.2 U
T-08	0.2 J	0.29 J	0.3	<0.3 U	0.2	0.2	<0.2 U
T-12B	--	--	--	--	--	--	--
T-13B	2.8	2.4	2.2	2.1	3.3	2.1	2.2
<b>Lower Aquifer Wells</b>							
LC-21C	--	--	--	--	--	<0.2 U	--
LC-26D	<0.4 U	0.082 J	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	--	--	--	--	<0.2 U	<0.2 U
LC-40D	<0.4 U	0.27 J	0.2 J	<0.3 U	<1 U	<2 U	<1 U
LC-41D	0.4 (0.4)	0.74 (0.64) J (J)	0.69 (0.75) J (J)	0.58 (0.64) J (J)	<1 (<1) U (U)	<1 (<1) U (U)	--
LC-47D	--	--	--	--	--	<0.2 U	<0.2 U
LC-50D	--	--	--	--	--	<0.2 U	--
LC-66D	0.3 (0.3) J (J)	<0.6 (0.3) U	0.37 (0.36) J (J)	0.35 (0.19) J (J)	<1 (<1) U (U)	<2 (<2) U (U)	<1 U
LC-67D	0.7	0.68	0.81	0.68	<1 U	<0.2 U	<1 U
LC-71D	<0.4 U	0.11 J	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	0.3 J	0.47 J	0.51 J	0.49 J	1.5 R	<2 U	<1 U
LC-73D	<0.4 U	0.3	0.33	0.19 J	<1 U	<2 U	<1 U
LC-74D	0.4 J	0.44 J	0.41 J	0.41 J	<1 U	<1 U	--
LC-75D	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--
LC-126	4.8	5.5	4.3	4.3	<1 U	2.4	1 U
LC-166D	<0.4 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	<0.4 U	0.1 J	0.097 J	<0.3 U	Discontinued	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 7 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	15th Quarter June-99	16th Quarter September-99	17th Quarter December-99	18th Quarter March-00	19th Quarter June-00	20th Quarter September-00	21st Quarter December-00
<b>Upper Aquifer Wells</b>							
LC-03	6	24	4.7 (4.9)	2.8 (3.2)	2.2 (2.1)	1.2	0.9
LC-05	2	4.4	1.3	1.2	2.2	4.7	4.2
LC-06	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-14A	<1 U	<1 U	<1 U	<1 U	<1 U	0.5 J	<1 U
LC-19A	<3 U	<1 U	<1 U	<1 U	<1 U	<1 U	<6 U
LC-19B	<3 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-19C	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-26	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U
LC-41A	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-44A	<1 (<1) U (U)	2.3 (2.2)	<1 U	<1 U	<1 U	<1 U	0.8
LC-49	<3 U	1.6	1.4	<5 U	2.3	2.0	<6 U
LC-49A	--	--	--	--	--	--	--
LC-51	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-53	<3 U	<1 U	<1 U	<3 U	<1 U	<2 U	<6 U
LC-64A	<10 (<1) U (U)	<5 (<5) U (U)	<9 U	<1 U	<3 U	<5 U	<0.2 U
LC-64B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 (<1) U (U)	<0.6 (<0.6) U (U)
LC-66A	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<1 U	<1 U	<1 U	<1 U
LC-66B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-73A	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<1 U	<1 U	<0.2 U	<1 U	<1 U
LC-111B	0.6 J	0.7	0.7	0.5	0.6	0.5	0.6
LC-116B	<0.2 U	0.2	0.2	<0.1 U	0.2	<0.2 U	0.2
LC-122B	0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<2 U
LC-132	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-134	13	70	99 (120)	53 (38)	38 (34)	70 (56)	--
LC-136A	<1,000 U	<1,000 U	<900 U	<1,500 U	<1,500 U	<2,000 U	<4,000 (<60) U (U)
LC-136B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-137A	<1 U	<1 U	<1 U	<1 U	<1 U	<3 U	<5 U
LC-137B	<3 U	<1 U	<1 (<1) U (U)	<1 (<2) U (U)	<1 (<1) U (U)	<3 (<3) U (U)	<6 (<6) U (U)
LC-137C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--	--	--	--	--
LC-144B	--	--	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-162	<3 U	<5 U	<3 U	<3 U	<3 U	<1 U	--
LC-165	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	0.2 J
PA-381	<1 U	<1 U	<1 U	<1 U	<1 U	<0.2 U	<1 U
PA-383	0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-01	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	--	--	--	--	--
T-04	0.8	<1 U	0.6	0.4	0.6	0.4	0.4
T-08	0.2	0.2	0.2	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-13B	2.5	2.4	2.4	2	1.9	1.4 (1.6)	1.7 (2.0)
<b>Lower Aquifer Wells</b>							
LC-21C	<0.2 U	<0.2 U	--	--	--	--	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-40D	<1 U	<1 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U
LC-41D	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<10) U (U)	<1 (<1) U (U)
LC-47D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-66D	<1 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-67D	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)
LC-71D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	<1 U	<1 U	<0.2 U	<1 U	<1 U	<0.2 U	<0.2 U
LC-73D	<1 U	<1 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U
LC-74D	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-75D	--	--	--	<0.2 U	<0.2 U	<1 U	<0.2 U
LC-76D	--	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
LC-77D	--	--	--	<1 U	<0.2 U	<0.2 U	<0.2 U
LC-126	<1 U	<1 U	<1 U	<1 U	<1 U	0.6 J	<2 U
LC-166D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2/4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 7 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	22nd Quarter March-01	23rd Quarter June-01	24th Quarter September-01
<b>Upper Aquifer Wells</b>			
LC-03	0.8	0.6	0.6
LC-05	3.0	2	3.6
LC-06	<1 U	<1 U	<1.0 U
LC-14A	<1 U	<1 U	<1.0 U
LC-19A	<1 U	<1 U	<1.0 U
LC-19B	<1 U	<1 U	<1.0 U
LC-19C	<1 U	<1 U	<1.0 U
LC-26	<0.2 U	<0.2 U	<0.2 U
LC-41A	<1 U	<1 U	<3.0 U
LC-44A	<0.6 U	<0.6 U	<0.6 U
LC-49	1.9	<3 U	<3.0 U
LC-49A	--	--	--
LC-51	<1 U	<1 U	<1.0 U
LC-53	<6 U	<1 U	<1.0 U
LC-64A	<0.2 U	<100 U	<100 U
LC-64B	<0.6 (<0.6) U (U)	<0.4 (<0.4) U	<0.2 (<0.2) U (U)
LC-66A	<1 U	<0.2 U	<1.0 U
LC-66B	<1 U	<1 U	<1.0 U
LC-73A	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<0.2 U
LC-111B	0.6	0.6	0.5
LC-116B	0.2	0.4	0.3
LC-122B	<0.2 U	<0.2 U	<0.2 U
LC-128	<0.6 U	<0.6 U	<0.6 UJ
LC-132	<1 U	<1 U	<1.0 U
LC-134	--	--	--
LC-136A	<4,000 U	<1,000 U	<100 U
LC-136B	<3 (<2) U (U)	<1 U	<1.0 (<1.0) U (U)
LC-137A	<6 U	<3 U	<5.0 (<5.0) U (U)
LC-137B	6 (<6) U (U)	<3 (<3) U	<5.0 U
LC-137C	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--
LC-144B	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 U	<0.2 U	<0.2 U
LC-162	--	--	--
LC-165	<0.2 U	0.2	<0.2 U
PA-381	R	<1 U	<0.6 U
PA-383	<0.2 U	<0.2 U	<0.2 U
T-01	--	--	--
T-04	0.6	0.5	0.4
T-08	<0.2 U	<0.2 U	0.3
T-12B	<0.2 U	<0.2 U	<0.2 U
T-13B	1.8 (1.8)	1.7 (1.7)	1.5 (1.6)
<b>Lower Aquifer Wells</b>			
LC-21C	<0.2 U	<0.2 U	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U
LC-35D	<0.2 U	<0.2 U	<0.2 U
LC-40D	<0.4 U	0.2	<0.2 U
LC-41D	<1 (<1) U (U)	<1 (<1) U	<1.0 (<1.0) U (U)
LC-47D	<0.2 U	<0.2 U	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U
LC-66D	<0.2 U	<0.2 U	<0.6 U
LC-67D	<1 (0.7) U	<1 (<1) U	<1.0 (<1.0) U (U)
LC-71D	<0.2 U	<0.2 U	<0.2 U
LC-72D	R	0.2	<0.2 U
LC-73D	<0.2 U	<0.2 U	<0.4 U
LC-74D	R	<1 U	<1.0 U
LC-75D	R	<0.2 U	<0.2 U
LC-76D	<0.2 U	<0.2 U	<0.2 U
LC-77D	R	<0.2 U	<0.2 U
LC-126	<2 U	<1 U	<1.0 U
LC-166D	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--
<b>Surface Water Stations</b>			
SW-MC-1	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 (<0.2) U (U)

**Notes:**

J - estimated value

R - result rejected

U - compound not detected

-- Well not sampled

Value with a "less than" symbol (<) indicates the compound was not detected at the listed detection limit.

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses; all other results are for EPA Method 8010 analyses.

**Table 7 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for 1,1,1-Trichloroethane (ug/L)**

Well	25th Quarter	26th Quarter
	December 2001	March 2002
<b>Wells Screened in Upper Aquifer</b>		
FL-2	NS	6.0 (6.0) U (U)
FL-3	0.2 (0.2) U (U)	0.2 U
FL-4A	0.2 U	0.2 U
FL-4B	0.2 U	0.2 U
FL-6	0.2 U	0.2 U
LC-03	0.2 U	0.3
LC-05	NS	0.7
LC-06	NS	0.6 U
LC-14A	NS	1.0 U
LC-16	0.9	0.4
LC-19A	1.0 U	4.0 U
LC-20	0.2 U	0.2 U
LC-24	0.2 U	0.2 U
LC-26	NS	0.2 U
LC-34	0.2 U	0.2 U
LC-41A	NS	4.0 U
LC-41B	10 U	2.0 U
LC-49	NS	10 U
LC-53	NS	4.0 U
LC-57	0.2 UJ	0.2 U
LC-61B	0.2 U	0.2 U
LC-64A	500 (500) U (U)	300 U
LC-64B	NS	0.2 (0.2) U (U)
LC-66B	NS	0.2
LC-111B	NS	0.5
LC-116B	NS	0.4
LC-122B	NS	0.2 U
LC-128	NS	0.4 U
LC-136A	1,500 U	2,000 U
LC-136B	NS	2.0 (2.0) U (U)
LC-137B	2.0 (2.0) U (U)	4.0 (4.0) U (U)
LC-137C	NS	0.2 U
LC-149C	NS	0.2 U
LC-167	0.2 U	0.2 U
MAMC-1	0.2 U	0.2 (0.2) U (U)
MAMC-6	0.2 U	0.2 U
PA-381	NS	1.0 U
PA-383	NS	0.2 U
T-04	NS	0.4
T-06	0.2 U	0.2 U
T-08	NS	0.2 U
T-10	NS	0.2 U
T-11B	NS	0.2 U
T-12B	0.2 U	0.2 U
T-13B	NS	1.3 (1.6)
<b>Wells Screened in Lower Aquifer</b>		
LC-21C	NS	0.2 U
LC-26D	NS	0.2 U
LC-35D	0.2 U	0.2 U
LC-40D	NS	0.2
LC-47D	0.2 U	0.2 U
LC-50D	0.2 U	0.2 U
LC-66D	NS	0.6 U
LC-67D	NS	4.0 (1.0) U (U)
LC-69D	10 U	1.0 U
LC-70D	0.2 U	0.2 U
LC-71D	NS	0.2 U
LC-72D	NS	0.2
LC-73D	NS	0.2 U
LC-74D	NS	1.0 U
LC-75D	0.2 U	0.2 U
LC-76D	0.2 U	0.2 U
LC-77D	0.2 U	0.2 U
LC-126	NS	1.0 (1.0) U (U)
MAMC-3	0.2 U	0.2 U
MAMC-4	0.2 (0.2) U (U)	0.2 U
PS-13	0.2 U	0.2 U
<b>Surface Water Stations</b>		
SW-MC-1	NS	0.2 U
SW-MC-4	0.2 (0.2) U (U)	0.2 (0.2) U (U)
SW-MC-6	0.2 U	0.2 U

**Notes:**

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses;

all other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 8**  
**Pre-Startup and Quarterly Sampling Results for Tetrachloroethene (µg/L)**

Well	Pre-Startup	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	5th Quarter	6th Quarter	7th Quarter
	February-95	December-95	March-96	June-96	September-96	December-96	March-97	July-97
<b>Upper Aquifer Wells</b>								
LC-03	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-05	0.36	<0.30 U	<0.30 U	0.14 J	0.1 J	<0.30 U	<0.3 U	<0.3 U
LC-06	0.65	0.26 J	<0.30 U	<0.30 U	0.5 J	<0.30 U	<0.3 U	0.14 J
LC-14A	0.16 J	<0.30 UJ	<0.30 U	<0.60 U	0.1 J	<0.60 U	<0.6 U	<0.6 U
LC-19A	--	--	--	--	--	--	--	--
LC-19B	--	--	--	--	--	--	--	--
LC-19C	--	--	--	--	--	--	--	--
LC-26	<0.30 U	<0.30 (<0.60) U (U)	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-41A	<0.30 U	<3.0 U	<1.5 U	<1.5 U	<1.0 U	<1.5 U	<1.5 U	<1.5 U
LC-44A	0.32	0.20 J	0.14 J	<0.30 U	0.2 J	<0.30 U	<0.3 U	<0.3 U
LC-49	0.22 J	<0.60 U	<3.0 U	<3.0 U	<1.0 U	<3.0 U	<3.0 U	<3.0 UJ
LC-49A	0.46	0.28 J	<1.5 U	<1.5 U	0.3 J	0.98	1.2	<0.6 U
LC-51	<0.30 U	<0.60 U	<1.5 (<1.5) U (U)	<1.5 U	<1.0 U	<1.5 U	<1.5 U	<1.5 (<1.5) U (U)
LC-53	<0.30 U	<0.60 U	<1.5 U	<1.5 U	<1.0 U	<1.5 U	<1.5 U	<1.5 U
LC-64A	0.48	<3.0 U	<3.0 (<3.0) U (U)	<3.0 U J	<2.5 U	<3.0 U	<3.0 U	<3.0 U
LC-64B	<0.30 U	<0.60 UJ	<0.60 U	<0.60 U	<0.5 U	<0.60 U	<0.6 U	<0.6 U
LC-66A	<0.30 U	<0.30 UJ	0.17 J	0.26 J	0.1 J	<1.5 U	<1.5 U	<1.5 U
LC-66B	0.16 J	<0.60 UJ	<1.5 U	<1.5 U	<1.0 U	<1.5 U	<1.5 U	<1.5 U
LC-73A	NA	<0.30 U	<0.30 U	<0.30 (<0.30) U (U)	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-108	<0.30 U	<3.0 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-111B	<0.30 U	<0.30 (<0.30) U (U)	<0.30 (<0.30) U (U)	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-116B	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-122B	<0.30 U	0.10 J	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-128	<0.30 U	<0.30 UJ	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-132	0.52	0.29 J	0.48 J	0.52	1.6	1.1	0.83	0.55 (.98) J
LC-134	3.2	<60 U	<30 U	<30 UJ	<5 U	<15 U	<15 U	<15 U
LC-136A	6.5	<150 (<150) U (U)	<150 U	<300 UJ	<250 U	<300 U	<300 U	<600 U
LC-136B	0.11 J	<1.5 U	<1.5 U	<1.5 UJ	<0.5 U	<300 U	<0.6 U	<0.6 U
LC-137A	0.26 (0.20) J (J)	<0.30 U	<0.30 U	<0.60 U	<1.0 U	<0.30 U	<0.6 U	<0.6 U
LC-137B	0.16 J	<1.5 U	<9.0 U	<1.5 U J	<1.0 U	0.31 J	<1.5 U	<1.5 U
LC-137C	<0.30 U		<0.30 U	<0.60 (<0.60) U (U)	<0.5 (<0.5) U (U)	<0.30 (<0.30) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)
LC-144A	<0.30 U	<0.60 U	<1.5 U	<1.5 UJ	<1.0 U	0.34 J	<0.6 U	<1.5 U
LC-144B	0.12 J	<0.60 U	<1.5 U	<1.5 (<1.5) U (U)	<1.0 (<1.0) U (U)	<1.5 (<1.5) U (U)	0.14 (<1.5) J (U)	<1.5 (<1.5) U (U)
LC-149C	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-149D	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-162	0.20 J	<6.0 U	<12 U	<12 UJ	<1.0 U	<6.0 U	<6.0 U	<6.0 U
LC-165	NA	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
PA-381	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	0.28 J	<0.3 U	<0.3 U
PA-383	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 (<0.5) U (U)	<0.60 (<0.30) U (U)	<0.3 (<0.3) U (U)	<0.3 U
T-01	<0.30 U	<0.30 (<0.30) UJ (UJ)	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
T-04	0.15 (0.30) J (U)	<0.30 UJ	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
T-08	0.13 J	0.11 J	<0.30 U	<0.30 U	0.2 J	<0.30 U	<0.3 U	<0.3 U
T-12B	--	--	--	--	--	--	--	--
T-13B	0.13 J	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
<b>Lower Aquifer Wells</b>								
LC-21C	--	--	--	--	--	--	--	--
LC-26D	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-35D	--	--	--	--	--	--	--	--
LC-40D	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-41D	<0.30 (<0.30) U (U)	<0.60 UJ	<1.5 U	<1.5 (<1.5) U (U)	<1.0 (<1.0) U (U)	<1.5 (<0.60) U (U)	<1.5 (<1.5) U (U)	<1.5 UJ
LC-47D	--	--	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--	--	--
LC-66D	<0.30 U	<0.30 UJ	<0.30 U	<0.60 (<0.30) U (U)	<0.5 (<0.5) U (U)	<0.60 U	<0.6 (<0.6) U (U)	<0.6 (<0.6) U (U)
LC-67D	<0.30 (<0.30) U (U)	<0.60 U	<0.60 U	<0.60 U	<0.5 U	<0.60 U	<0.6 U	<0.3 U
LC-71D	<0.30 U	<0.30 UJ	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-72D	<0.30 U	<0.30 (<0.60) U (U)	<0.30 U	<0.60 U	<0.5 U	<0.60 U	<0.6 U	<0.6 U
LC-73D	<0.30 U	<0.30 U	<0.30 (<0.30) U (U)	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-74D	--	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LC-75D	--	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--	--
LC-126	<0.30 U	<0.60 U	<0.60 U	<1.5 U	<1.0 U	<1.5 U	<1.5 U	<1.5 U
LC-166D	--	<0.30 (0.10) UJ (J)	<0.30 (<0.60) U (U)	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
LF4-MW-2C	<0.30 U	<0.30 U	<0.30 U	<0.30 U	<0.5 U	<0.30 U	<0.3 U	<0.3 U
<b>Surface Water Stations</b>								
SW-MC-1	<0.50 U	<0.50 U	<0.50 U	<0.50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
SW-MC-2	<0.50 U	<0.50 (<0.50) U (U)	<0.50 (<0.50) U (U)	<0.20 (<0.20) U (U)	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)

**Table 8 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Tetrachloroethene (µg/L)**

Well	8th Quarter September-97	9th Quarter December-97	10th Quarter March-98	11th Quarter June-98	12th Quarter September-98	13th Quarter December-98	14th Quarter March-99
<b>Upper Aquifer Wells</b>							
LC-03	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-05	<0.5 U	0.26 J	0.15 J	0.2 J	<1 U	<1 U	<1 U
LC-06	0.2 J	0.35	0.12 J	0.36	<1 U	<1 (<1) U (U)	<1 U
LC-14A	<0.5 U	<0.6 U	<0.6 U	<0.6 U	<1 U	<1 U	<1 U
LC-19A	--	--	--	--	1.2	<1 U	<1 U
LC-19B	--	--	--	--	2 (2.4)	2.7	<3 U
LC-19C	--	--	--	--	<1 U	<0.2 U	<1 U
LC-26	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-41A	<0.5 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 U
LC-44A	<0.5 U	<0.3 U	0.11 J	0.16 J	<1 U	<1 U	<1 U
LC-49	<0.5 U	<3.0 U	<0.3 U	<3.0 U	<1 U	<3 U	<3 U
LC-49A	0.3 J	0.53 J	0.36 J	0.32 J	Discontinued	--	--
LC-51	0.2 J	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 U
LC-53	<0.5 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<3 U	<3 U
LC-64A	<2.5 U	1.4 J	<1.5 U	3.9 J	<3 U	<5 U	<10 U
LC-64B	<0.5 U	<0.6 U	<0.6 U	<0.6 U	<1 U	<1 U	<1 U
LC-66A	<0.5 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 (<1) U (U)
LC-66B	<0.5 U	<1.5 U	<1.5 U	0.65 J	<1 U	<5 U	<1 U
LC-73A	<0.5 U	<0.3 U	<0.3 U	<0.3 U	55	<0.2 U	<0.2 (<0.2) U (U)
LC-108	<0.5 U	0.31	<0.3 U	0.15 J	<1 U	<1 U	<0.2 U
LC-111B	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-128	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<1 U	<1 U	<1 (<1) U (U)
LC-132	0.9	1	0.83	1.4	<1 U	1.1	<1 U
LC-134	<10 U	<30 U	<30 U	<30 U	<15 U	<15 U	<30 U
LC-136A	<250 U	150 J	<600 U	420 J	100 U	<900 U	<1000 U
LC-136B	<0.5 U	0.26 J	<0.6 U	0.26 J	<1 U	<1 U	<1 U
LC-137A	<1.0 U	0.23 J	<0.6 U	0.32 J	<15 U	<1 U	<1 (<1) U (U)
LC-137B	<0.5 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 U
LC-137C	<0.5 (<0.5) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	<1 (<1) U (U)	<1 (<0.2) U (U)	<1 U
LC-144A	<0.5 U	<1.5 U	<3.0 U	<1.5 U	Discont.(See LC-19A,B,C)	--	--
LC-144B	<0.5 (<0.5) U (U)	<1.5 (<1.5) U (U)	<1.5 (<1.5) U (U)	<1.5 (0.54) U (J)	Discont.(See LC-19A,B,C)	--	--
LC-149C	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-162	<2.5 U	<6.0 U	<6.0 U	<6.0 U	<3 U	<2 U	<3 U
LC-165	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
PA-381	<0.5 U	0.12 J	<0.3 U	<0.3 U	<1 U	<1 U	<1 U
PA-383	<0.5 (<0.5) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	<0.3 (<0.3) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U
T-01	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
T-04	<0.5 U	<0.3 U	<0.3 U	0.12 J	<1 U	<0.2 U	<0.2 U
T-08	<0.5 U	0.14 J	0.21 J	<0.3 U	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	--	--	--	--	--
T-13B	<0.5 U	<0.3 U	0.12 J	<0.3 U	<0.2 U	<0.2 U	<0.2 U
<b>Lower Aquifer Wells</b>							
LC-21C	--	--	--	--	--	<0.2 U	NA
LC-26D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	--	--	--	--	<0.2 U	<0.2 U
LC-40D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<1 U	2 U	<1 U
LC-41D	<0.5 (<0.5) U (U)	<1.5 (<1.5) U (U)	<1.5 (<1.5) U (U)	<1.5 (<1.5) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	--
LC-47D	--	--	--	--	--	<0.2 U	<0.2 U
LC-50D	--	--	--	--	--	<0.2 U	--
LC-66D	<0.5 (<0.5) U (U)	<0.6 (<0.3) U (U)	<0.6 (<0.6) U (U)	0.23 (0.11) J (J)	<1 (<1) U (U)	<2 (<2) U (U)	<1 (<1) U (U)
LC-67D	<0.5 U	<0.6 U	<0.6 U	<0.6 U	<1 U	2 U	<1 U
LC-71D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	<0.5 U	<0.3 U	<0.6 U	<0.6 U	20 R	2 U	<1 U
LC-73D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<1 U	2 U	<1 U
LC-74D	<0.5 U	<0.6 U	<0.6 U	<0.6 U	<1 U	<1 U	--
LC-75D	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--
LC-126	<0.5 U	<1.5 U	<1.5 U	<1.5 U	<1 U	<1 U	<1 U
LC-166D	<0.5 U	<0.3 U	<0.3 U	<0.3 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	<0.5 U	<0.3 U	<0.3 U	<0.3 U	Discontinued	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)	<0.5 (<0.5) U (U)	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 8 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Tetrachloroethene (µg/L)**

Well	15th Quarter	16th Quarter	17th Quarter	18th Quarter	19th Quarter	20th Quarter	21st Quarter
	June-99	September-99	December-99	March-00	June-00	September-00	December-00
<b>Upper Aquifer Wells</b>							
LC-03	<0.2 U	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<1 U	<0.2 U
LC-05	<1 U	<1 U	<1 U	<0.2 U	<1 U	<1 U	<1 U
LC-06	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-14A	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-19A	<3 U	<1 U	<1 U	<1 U	<1 U	<1 U	<6 U
LC-19B	<3 U	1.6	<1 U	2.4	1.6	2.5	4.2
LC-19C	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-26	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U
LC-41A	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-44A	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<1 U	<1 U	<1 U	1.4
LC-49	<3 U	<1 U	<1 U	<5 U	<0.2 U	<1 U	<6 U
LC-49A	--	--	--	--	--	--	--
LC-51	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-53	<3 U	<1 U	<1 U	<3 U	<1 U	<2 U	<6 U
LC-64A	<10 (<1) U (U)	<5 (<5) U (U)	<9 U	<1 U	<3 U	<5 U	<0.2 U
LC-64B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 (<1) U (U)	<0.6 (<0.6) U (U)
LC-66A	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<1 U	<1 U	<1 U	<1 U
LC-66B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-73A	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<1 U	<1 U	<0.2 U	<1 U	<0.2 U
LC-111B	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.2 UJ	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<2 U
LC-132	<1 U	<1 U	1.1	1 J	1.1	0.9 J	<2 U
LC-134	<5 U	<10 U	30 (0.9) U	<10 (<30) U (U)	<10 (<15) U (U)	<20 (<15) U (U)	--
LC-136A	<1,000 U	<1,000 U	<900 U	<1,500 U	<1,500 U	<2,000 U	<4,000 (<60) U (U)
LC-136B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-137A	<1 U	<1 U	<1 U	<1 U	<1 U	<3 U	<5 U
LC-137B	<3 U	<1 U	<1 (<1) U (U)	<1 (<2) U (U)	<1 (<1) U (U)	<3 (<3) U (U)	<6 (<6) U (U)
LC-137C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--	--	--	--	--
LC-144B	--	--	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-162	<3 U	<5 U	3 U	<3 U	<3 U	<1 U	--
LC-165	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
PA-381	<1 U	<1 U	<1 U	<1 U	<1 U	<0.2 U	<1 U
PA-383	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-01	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	--	--	--	--	--
T-04	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-08	<0.2 U	<0.2 U	0.3	0.3	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-13B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)
<b>Lower Aquifer Wells</b>							
LC-21C	<0.2 U	<0.2 U	--	--	--	--	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-40D	<1 U	<1 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U
LC-41D	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<10) U (U)	<1 (<1) U (U)
LC-47D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-66D	<1 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-67D	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)
LC-71D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	<1 U	<1 U	<0.2 U	<1 U	<1 U	<0.2 U	<0.2 U
LC-73D	<1 U	<1 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U
LC-74D	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-75D	--	--	--	<0.2 U	<0.2 U	<1 U	<0.2 U
LC-76D	--	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 UJ
LC-77D	--	--	--	<1 U	<0.2 U	<0.2 U	<0.2 U
LC-126	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-166D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2/4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 8 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Tetrachloroethene (µg/L)**

Well	22nd Quarter	23rd Quarter	24th Quarter
	March-01	June-01	September-01
<b>Upper Aquifer Wells</b>			
LC-03	<0.2 U	<0.2 U	<0.2 U
LC-05	0.2	<1 U	<1.0 U
LC-06	<1 U	<1 U	<1.0 U
LC-14A	<1 U	<1 U	<1.0 U
LC-19A	<1 U	<1 U	<1.0 U
LC-19B	3.1	5.7	3.0
LC-19C	<1 U	<1 U	<1.0 U
LC-26	<0.2 U	<0.2 U	<0.2 U
LC-41A	<1 U	<1 U	<3.0 U
LC-44A	<0.6 U	<0.6 U	<0.6 U
LC-49	<1 U	<3 U	<3.0 U
LC-49A	--	--	--
LC-51	<1 U	<1 U	<1.0 U
LC-53	<6 U	<1 U	<1.0 U
LC-64A	0.9	<100 U	<100 U
LC-64B	<0.6 (<0.6) U (U)	<0.4 (<0.4) U	<0.2 (<0.2) U (U)
LC-66A	<1 U	<0.2 U	<1.0 U
LC-66B	<1 U	<1 U	<1.0 U
LC-73A	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<0.2 U
LC-111B	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.2 U	<0.2 U	<0.2 U
LC-128	<0.6 U	<0.6 U	<0.6 UJ
LC-132	1	<1 U	<1.0 U
LC-134	--	--	--
LC-136A	<4,000 U	<1,000 U	<100 U
LC-136B	<3 (<2) U (U)	<1 U	<1.0 (<1.0) U (U)
LC-137A	6 U	<3 U	<5.0 (<5.0) U (U)
LC-137B	6 (<6) U (U)	<3 (<3) U	<5.0 U
LC-137C	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--
LC-144B	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 U	<0.2 U	<0.2 U
LC-162	--	--	--
LC-165	<0.2 U	<0.2 U	<0.2 U
PA-381	R	<1 U	<0.6 U
PA-383	<0.2 U	<0.2 U	<0.2 U
T-01	--	--	--
T-04	<0.2 U	<0.2 U	<0.2 U
T-08	<0.2 U	<0.2 U	0.2
T-12B	<0.2 U	<0.2 U	<0.2 U
T-13B	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 (<0.2) U (U)
<b>Lower Aquifer Wells</b>			
LC-21C	<0.2 U	<0.2 U	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U
LC-35D	<0.2 U	<0.2 U	<0.2 U
LC-40D	<0.4 U	<0.2 U	<0.2 U
LC-41D	<1 (<1) U (U)	<1 (<1) U (U)	<1.0 (<1.0) U (U)
LC-47D	<0.2 U	<0.2 U	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U
LC-66D	<0.2 U	<0.2 U	<0.6 U
LC-67D	<1 (<0.4) U (U)	<1 (<1) U	<1.0 (<1.0) U (U)
LC-71D	<0.2 U	<0.2 U	<0.2 U
LC-72D	R	<0.2 U	<0.2 U
LC-73D	<0.2 U	<0.2 U	<0.4 U
LC-74D	R	<1 U	<1.0 U
LC-75D	R	<0.2 U	<0.2 U
LC-76D	<0.2 U	<0.2 U	<0.2 U
LC-77D	R	<0.2 U	<0.2 U
LC-126	<2 U	<1 U	<1.0 U
LC-166D	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--
<b>Surface Water Stations</b>			
SW-MC-1	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 (<0.2) U (U)

**Notes:**

J - estimated value

R - result rejected

U - compound not detected

-- Well not sampled

Value with a "less than" symbol (<) indicates the compound was not detected at the listed detection limit.

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses; all other results are for EPA Method 8010 analyses.

**Table 8 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Tetrachloroethene (µg/L)**

Well	25th Quarter	26th Quarter
	December 2001	March 2002
<b>Wells Screened in Upper Aquifer</b>		
FL-2	NS	6.0 (6.0) U (U)
FL-3	0.2 (0.2) U (U)	0.2 U
FL-4A	0.2 U	0.2 U
FL-4B	0.2 U	0.2 U
FL-6	0.2 U	0.2 U
LC-03	0.2 U	0.2 U
LC-05	NS	0.4 U
LC-06	NS	0.6 U
LC-14A	NS	1.0 U
LC-16	0.4 U	0.2 U
LC-19A	1.0 U	4.0 U
LC-20	0.2 U	0.2 U
LC-24	0.2 U	0.2 U
LC-26	NS	0.2 U
LC-34	0.2 U	0.2 U
LC-41A	NS	4.0 U
LC-41B	10 U	2.0 U
LC-49	NS	10 U
LC-53	NS	4.0 U
LC-57	0.2 U	0.2 U
LC-61B	0.2 U	0.2 U
LC-64A	500 (500) U (U)	300 U
LC-64B	NS	0.2 (0.2) U (U)
LC-66B	NS	0.2
LC-111B	NS	0.2 U
LC-116B	NS	0.2 U
LC-122B	NS	0.2 U
LC-128	NS	0.4 U
LC-136A	1,500 U	2,000 U
LC-136B	NS	2.0 (2.0) U (U)
LC-137B	2.0 (2.0) U (U)	4.0 (4.0) U (U)
LC-137C	NS	0.2 U
LC-149C	NS	0.2 U
LC-167	0.2 U	0.2 U
MAMC-1	0.2 U	0.2 (0.2) U (U)
MAMC-6	0.2 U	0.2 U
PA-381	NS	1.0 U
PA-383	NS	0.2 U
T-04	NS	0.2 U
T-06	0.2 U	0.2 U
T-08	NS	0.2
T-10	NS	0.2 U
T-11B	NS	0.2 U
T-12B	0.2 U	0.2 U
T-13B	NS	0.2 (0.2) U (U)
<b>Wells Screened in Lower Aquifer</b>		
LC-21C	NS	0.2 U
LC-26D	NS	0.2 U
LC-35D	0.2 U	0.2 U
LC-40D	NS	0.2 U
LC-47D	0.2 U	0.2 U
LC-50D	0.2 U	0.2 U
LC-66D	NS	0.6 U
LC-67D	NS	4.0 (1.0) U (U)
LC-69D	10 U	1.0 U
LC-70D	0.2 U	0.2 U
LC-71D	NS	0.2 U
LC-72D	NS	0.2 U
LC-73D	NS	0.2 U
LC-74D	NS	1.0 U
LC-75D	0.2 U	0.2 U
LC-76D	0.2 U	0.2 U
LC-77D	0.2 U	0.2 U
LC-126	NS	1.0 (1.0) U (U)
MAMC-3	0.2 U	0.2 U
MAMC-4	0.2 (0.2) U (U)	0.2 U
PS-13	0.2 U	0.2 U
<b>Surface Water Stations</b>		
SW-MC-1	NS	0.2 U
SW-MC-4	0.2 (0.2) U (U)	0.2 (0.2) U (U)
SW-MC-6	0.2 U	0.2 U

**Notes:**

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses;

all other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 9**  
**Pre-Startup and Quarterly Sampling Results for Vinyl Chloride (mg/L)**

Well	Pre-Startup February-95	1st Quarter December-95	2nd Quarter March-96	3rd Quarter June-96	4th Quarter September-96	5th Quarter December-96	6th Quarter March-97	7th Quarter July-97
<b>Upper Aquifer Wells</b>								
LC-03	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-05	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-06	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-14A	<1.8 U	<1.8 U	<1.8 U	<3.6 U	<0.4 U	<3.6 U	<3.6 U	<3.6 U
LC-19A	--	--	--	--	--	--	--	--
LC-19B	--	--	--	--	--	--	--	--
LC-19C	--	--	--	--	--	--	--	--
LC-26	<1.8 U	<1.8 (<3.6) U (U)	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-41A	<1.8 U	<1.8 U	<9.0 U	<9.0 U	<0.8 U	<9.0 U	<9.0 U	9.0 U
LC-44A	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-49	<1.8 U	<3.6 U	<1.8 U	<1.8 U	<0.8 U	<1.8 U	<1.8 U	<1.8 U
LC-49A	<1.8 U	<3.6 U	<9.0 U	<1.8 U	<0.8 U	<3.6 U	<3.6 U	<3.6 U
LC-51	<1.8 U	<3.6 U	<9.0 (<9.0) U (U)	<9.0 U	<0.8 U	<9.0 U	<9.0 U	<9.0 (<9.0) U (U)
LC-53	<1.8 U	<3.6 U	<9.0 U	<9.0 U	<0.8 U	<9.0 U	<9.0 U	<9.0 U
LC-64A	<1.8 U	<1.8 U	<1.8 (<1.8) U (U)	<1.8 U	<2.0 U	<1.8 U	<1.8 U	<1.8 U
LC-64B	<1.8 U	<3.6 U	<3.6 U	<3.6 U	<0.4 U	<3.6 U	<3.6 U	<3.6 U
LC-66A	<1.8 U	<1.8 U	<1.8 U	<3.6 U	<0.4 U	<9.0 U	<9.0 U	<9.0 U
LC-66B	<1.8 U	<1.8 U	<9.0 U	<9.0 U	<0.8 U	<9.0 U	<9.0 U	<9.0 U
LC-73A	--	<1.8 U	<1.8 U	<1.8 (<1.8) U (U)	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-108	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-111B	<1.8 U	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-116B	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-122B	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-128	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-132	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<3.6 U	<3.6 (<1.8) U (U)
LC-134	31	<360 U	<180 U	<180 U	35	27 J	<90 U	<90 U
LC-136A	<1.8 U	<900 (<900) U (U)	<900 U	<1,800 U	<200 U	<1,800 U	<1,800 U	<3,600 U
LC-136B	<1.8 U	<9.0 U	<9.0 U	<9.0 U	<0.4 U	<1,800 U	<3.6 U	<3.6 U
LC-137A	<1.8 (<1.8) U (U)	<1.8 U	<1.8 U	<3.6 U	<0.8 U	<1.8 U	<3.6 U	<3.6 U
LC-137B	<1.8 U	<9.0 U	<9.0 U	<9.0 U	<0.8 U	<3.6 U	<9.0 U	<9.0 U
LC-137C	<1.8 U	<1.8 U	<1.8 U	<3.6 (<3.6) U (U)	<0.4 (<0.4) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)
LC-144A	<1.8 U	<3.6 U	<9.0 U	<9.0 U	<0.8 U	<3.6 U	<3.6 U	<9.0 U
LC-144B	<1.8 U	<3.6 U	<9.0 U	<9.0 (<9.0) U (U)	<0.8 (<0.8) U (U)	<9.0 (<9.0) U (U)	<1.8 (<9.0) U (U)	<9.0 (<9.0) U (U)
LC-149C	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-149D	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-162	90	46	160	110	230	150	130	100
LC-165	--	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
PA-381	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
PA-383	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 (<0.4) U (U)	<3.6 (<1.8) U (U)	<1.8 (<1.8) U (U)	<1.8 U
T-01	<1.8 U	<1.8 (<1.8) U (U)	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
T-04	<1.8 (<1.8) U (U)	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
T-08	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
T-12B	--	--	--	--	--	--	--	--
T-13B	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
<b>Lower Aquifer Wells</b>								
LC-21C	--	--	--	--	--	--	--	--
LC-26D	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-35D	--	--	--	--	--	--	--	--
LC-40D	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-41D	<1.8 (<1.8) U (U)	<3.6 U	<9.0 U	<9.0 (<9.0) U (U)	<0.8 (<0.8) U (U)	<9.0 (<3.6) U (U)	<9.0 (<9.0) U (U)	<9.0 U
LC-47D	--	--	--	--	--	--	--	--
LC-50D	--	--	--	--	--	--	--	--
LC-66D	<1.8 U	<1.8 U	<1.8 U	<3.6 (<1.8) U (U)	<0.4 (0.4) U (U)	<3.6 U	<3.6 (<3.6) U (U)	<3.6 (<3.6) U (U)
LC-67D	<1.8 (<1.8) U (U)	<3.6 U	<3.6 U	<3.6 U	<0.4 U	<3.6 U	<3.6 U	<1.8 U
LC-71D	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-72D	<1.8 U	<1.8 (<3.6) U (U)	<1.8 U	<3.6 U	<0.4 U	<3.6 U	<3.6 U	<3.6 U
LC-73D	<1.8 U	<1.8 U	<1.8 (<1.8) U (U)	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-74D	--	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LC-75D	--	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--	--
LC-126	<1.8 U	<3.6 U	<3.6 U	<9.0 U	<0.8 U	<9.0 U	<9.0 U	<9.0 U
LC-166D	--	<1.8 (<1.8) U (U)	<1.8 (<3.6) U (U)	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
LF4-MW-2C	<1.8 U	<1.8 U	<1.8 U	<1.8 U	<0.4 U	<1.8 U	<1.8 U	<1.8 U
<b>Surface Water Stations</b>								
SW-MC-1	<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.40 U	<0.40 U
SW-MC-2	<0.40 U	<0.40 (<0.40) U (U)	<0.40 (<0.40) U (U)	<0.20 (<0.20) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)

**Table 9 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Vinyl Chloride (mg/L)**

Well	8th Quarter September-97	9th Quarter December-97	10th Quarter March-98	11th Quarter June-98	12th Quarter September-98	13th Quarter December-98	14th Quarter March-99
<b>Upper Aquifer Wells</b>							
LC-03	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-05	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<1 U
LC-06	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 (<2) U (U)	<1 U
LC-14A	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	<1 U
LC-19A	--	--	--	--	<2 U	<2 U	<1 U
LC-19B	--	--	--	--	<2 (<2) U (U)	<2 U	<3 U
LC-19C	--	--	--	--	<2 U	<0.2 U	<1 U
LC-26	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-41A	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<2 U	<1 U
LC-44A	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<1 U
LC-49	<0.4 U	<18 U	<3.5 U	<18 U	<2 U	<6 U	<3 U
LC-49A	<0.4 U	<3.6 U	<3.6 U	<3.6 U	Discontinued	--	--
LC-51	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<2 U	<1 U
LC-53	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<6 U	<3 U
LC-64A	<2.0 U	<18 U	<9.0 U	<36 U	6 U	<10 U	10 U
LC-64B	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	<1 U
LC-66A	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<2 U	<1 (<1) U (U)
LC-66B	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<10 U	<1 U
LC-73A	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<0.2 U	<0.2 (<0.2) U (U)
LC-108	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<0.2 U
LC-111B	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<1 (<1) U
LC-128	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<1 (<1) U (U)
LC-132	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	<1 U
LC-134	16	<180 U	<180 U	<180 U	18 J	<30 U	<30 U
LC-136A	<200 U	<1,800 U	<3,600 U	<3,600 U	200	<1,800 U	<1,000 U
LC-136B	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	<1 U
LC-137A	<0.8 U	<3.6 U	<3.6 U	<3.6 U	<30 U	<2 U	<1 (<1) U (U)
LC-137B	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<2 U	<1 U
LC-137C	<0.4 (<0.4) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<2 (<2) U (U)	<2 (<0.2) U (U)	<1 U
LC-144A	<0.4 U	<9.0 U	18 U	<9.0 U	Discont.(See LC-19A,B,C)	--	--
LC-144B	<0.4 (<0.4) U (U)	<9.0 (<9.0) U (U)	<9.0 (<9.0) U (U)	<9.0 (<9.0) U (U)	Discont.(See LC-19A,B,C)	--	--
LC-149C	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-162	130	79	92	95	110	70	110
LC-165	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
PA-381	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<1 U
PA-383	<0.4 (<0.4) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<1.8 (<1.8) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U
T-01	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
T-04	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<0.2 U	<0.2 U
T-08	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	--	--	--	--	--
T-13B	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
<b>Lower Aquifer Wells</b>							
LC-21C	--	--	--	--	--	<0.2 U	--
LC-26D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	--	--	--	--	<0.2 U	<0.2 U
LC-40D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	2 U
LC-41D	<0.4 (<0.4) U (U)	<9.0 (<9.0) U (U)	<9.0 (<9.0) U (U)	<9.0 (<9.0) U (U)	<2 (<2) U (U)	<2 (<2) U (U)	--
LC-47D	--	--	--	--	--	<0.2 U	<0.2 U
LC-50D	--	--	--	--	--	<0.2 U	--
LC-66D	<0.4 (<0.4) U (U)	<3.6 (<1.8) U (U)	<3.6 (<3.6) U (U)	<3.6 (<1.8) U (U)	<2 (<2) U (U)	<2 (<2) U (U)	1 (1) U (U)
LC-67D	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	<1 U
LC-71D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U R	<2 U	<1 U
LC-73D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<2 U	<2 U	<1 U
LC-74D	<0.4 U	<3.6 U	<3.6 U	<3.6 U	<2 U	<2 U	--
LC-75D	--	--	--	--	--	--	--
LC-76D	--	--	--	--	--	--	--
LC-77D	--	--	--	--	--	--	--
LC-126	<0.4 U	<9.0 U	<9.0 U	<9.0 U	<2 U	<2 U	<1 U
LC-166D	<0.4 U	<1.8 U	<1.8 U	<1.8 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	<0.4 U	<1.8 U	<1.8 U	<1.8 U	Discontinued	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.4 (<0.4) U (U)	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 9 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Vinyl Chloride (µg/L)**

Well	15th Quarter June-99	16th Quarter September-99	17th Quarter December-99	18th Quarter March-00	19th Quarter June-00	20th Quarter September-00	21st Quarter December-00
<b>Upper Aquifer Wells</b>							
LC-03	<0.2 U	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<1 U	<0.2 U
LC-05	<1 U	<1 U	<1 U	<0.2 U	<1 U	<1 U	<1 U
LC-06	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-14A	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-19A	<3 U	<1 U	<1 U	<1 U	<1 U	<1 U	<6 U
LC-19B	<3 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-19C	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-26	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U
LC-41A	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-44A	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<1 U	<1 U	<1 U	<0.6 U
LC-49	<3 U	<1 U	<1 U	<5 U	<0.2 U	<1 U	<6 U
LC-49A	--	--	--	--	--	--	--
LC-51	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-53	<3 U	<1 U	<1 U	<3 U	<1 U	<2 U	<6 U
LC-64A	10 (1) U (U)	5 (5) U (U)	<9 U	<1 U	<3 U	<5 U	<0.2 U
LC-64B	<1 U	1 U	<1 U	<1 U	<1 U	<1 (<1) U (U)	<0.6 (<0.6) U (U)
LC-66A	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<1 U	<1 U	<1 U	<1 U
LC-66B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
LC-73A	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<1 U	<1 U	<0.2 U	<1 U	<0.2 U
LC-111B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-128	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 U	<2 U
LC-132	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-134	7.6	19	23 (30) U (U)	<30 (5.7) U (U)	12 (<15) U	54 (33)	--
LC-136A	<1,000 U	<1,000 U	<900 U	<1,500 U	<1,500 U	<2,000 U	<4,000 (<60) U (U)
LC-136B	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-137A	<1 U	<1 U	<1 U	<1 U	<1 U	<3 U	<5 U
LC-137B	<3 U	<1 U	<1 (<1) U (U)	<1 (<2) U (U)	<1 (<1) U (U)	<3 (<3) U (U)	<6 (<6) U (U)
LC-137C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--	--	--	--	--
LC-144B	--	--	--	--	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-162	160	90	120	130	130	410	--
LC-165	0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
PA-381	<1 U	<1 U	<1 U	<1 U	<1 U	<0.2 U	<1 U
PA-383	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-01	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	--	--	--	--	--
T-04	<0.2 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-08	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-12B	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
T-13B	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)
<b>Lower Aquifer Wells</b>							
LC-21C	<0.2 U	<0.2 U	--	--	--	--	<0.2 U
LC-26D	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-35D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-40D	<1 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-41D	<1 U	<1 U	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<10) U (U)	<1 (<1) U (U)
LC-47D	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U	--	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-66D	1 U	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-67D	1 (1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)	<1 (<1) U (U)
LC-71D	<1 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-72D	<1 U	<1 U	<0.2 U	<1 U	<1 U	<0.2 U	<0.2 U
LC-73D	<1 U	<1 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U
LC-74D	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-75D	--	--	--	<0.2 U	<0.2 U	<1 U	<0.2 U
LC-76D	--	--	--	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LC-77D	--	--	--	<1 U	<0.2 U	<0.2 U	<0.2 U
LC-126	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<2 U
LC-166D	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--	--	--	--	--
<b>Surface Water Stations</b>							
SW-MC-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
SW-MC-2/4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)	<0.2 (<0.2) U (U)

**Table 9 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Vinyl Chloride (µg/L)**

Well	22nd Quarter	23rd Quarter	24th Quarter
	March-01	June-01	September-01
<b>Upper Aquifer Wells</b>			
LC-03	<0.2 U	<0.2 U	<0.2 U
LC-05	<0.2 U	<1 U	<0.020 U
LC-06	<1 U	<1 U	<0.020 U
LC-14A	<1 U	<1 U	<0.020 U
LC-19A	R	<1 U	<0.20 U
LC-19B	R	<1 U	<0.20 U
LC-19C	R	<1 U	<0.20 U
LC-26	<0.2 U	<0.2 U	<0.2 U
LC-41A	<1 U	<1 U	<0.20 U
LC-44A	<0.6 U	<0.6 U	<0.020 U
LC-49	<1 U	<3 U	<0.020 U
LC-49A	--	--	--
LC-51	R	<1 U	<0.020 U
LC-53	<6 U	<1 U	<0.020 U
LC-64A	0.3	<100 U	27
LC-64B	<0.6 (<0.6) U (U)	<0.4 (<0.4) U	<0.2 (<0.2) U (U)
LC-66A	<1 U	<0.2 U	<0.20 U
LC-66B	<1 U	<1 U	<0.20 U
LC-73A	<0.2 U	<0.2 U	<0.2 U
LC-108	<0.2 U	<0.2 U	<0.2 U
LC-111B	<0.2 U	<0.2 U	<0.2 U
LC-116B	<0.2 U	<0.2 U	<0.2 U
LC-122B	<0.2 U	<0.2 U	--
LC-128	<0.6 U	<0.6 U	<0.020 U
LC-132	<1 U	<1 U	<0.020 U
LC-134	--	--	--
LC-136A	<4,000 U	<1,000 U	3.2 J
LC-136B	<3 (<2) U (U)	<1 U	<0.20 (<0.20) U (U)
LC-137A	<6 U	<3 U	<0.020 (<0.020) U (U)
LC-137B	6 (<6) U (U)	<3 (<3) U	<0.020 U
LC-137C	<0.2 U	<0.2 U	<0.2 U
LC-144A	--	--	--
LC-144B	--	--	--
LC-149C	<0.2 U	<0.2 U	<0.2 U
LC-149D	<0.2 U	<0.2 U	<0.2 U
LC-162	--	--	--
LC-165	<0.2 U	<0.2 U	<0.2 U
PA-381	R	<1 U	<0.20 U
PA-383	<0.2 U	<0.2 U	<0.2 U
T-01	--	--	--
T-04	<0.2 U	<0.2 U	<0.2 U
T-08	<0.2 U	<0.2 U	<0.2 U
T-12B	<0.2 U	<0.2 U	<0.2 U
T-13B	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 (0.2) U (U)
<b>Lower Aquifer Wells</b>			
LC-21C	<0.2 U	<0.2 U	<0.2 U
LC-26D	<0.2 U	<0.2 U	<0.2 U
LC-35D	<0.2 U	<0.2 U	<0.2 U
LC-40D	<0.4 U	<0.2 U	<0.2 U
LC-41D	<1 (<1) R (U)	<1 (<1) U	<0.20 (<0.20) U (U)
LC-47D	<0.2 U	<0.2 U	<0.2 U
LC-50D	<0.2 U	<0.2 U	<0.2 U
LC-66D	<0.2 U	<0.2 U	<0.20 U
LC-67D	<1 (<0.4) U (U)	<1 (<1) U	<0.20 (<0.20) U (U)
LC-71D	<0.2 U	<0.2 U	<0.2 U
LC-72D	R	<0.2 U	<0.020 U
LC-73D	<0.2 U	<0.2 U	<0.4 U
LC-74D	R	<1 U	<0.020 U
LC-75D	R	<0.2 U	<0.2 U
LC-76D	<0.2 U	<0.2 U	<0.2 U
LC-77D	R	<0.2 U	<0.2 U
LC-126	<2 U	<1 U	<0.020 U
LC-166D	<0.2 U	<0.2 U	<0.2 U
LF4-MW-2C	--	--	--
<b>Surface Water Stations</b>			
SW-MC-1	<0.2 U	<0.2 U	<0.2 U
SW-MC-4	<0.2 (<0.2) U (U)	<0.2 (<0.2) U	<0.2 U

J - estimated value

R - result rejected

U - compound not detected

-- Well not sampled

Value with a "less than" symbol (<) indicates the compound was not detected at the listed detection limit.

Results in parentheses are for blind duplicate samples.

September 1996 and September 1997 and later results are for EPA Method 8260 analyses; all other results are for EPA Method 8010 analyses.

**Table 9 (Continued)**  
**Pre-Startup and Quarterly Sampling Results for Vinyl Chloride (ug/L)**

Well	25th Quarter	26th Quarter
	December 2001	March 2002
<b>Wells Screened in Upper Aquifer</b>		
FL-2	NS	0.020 (0.020) U (U)
FL-3	0.020 (0.020) U (U)	0.2 U
FL-4A	0.02 U	0.2 U
FL-4B	0.02 U	0.2 U
FL-6	0.02 U	0.2 U
LC-03	0.2 U	0.2 U
LC-05	NS	0.4 U
LC-06	NS	0.020 U
LC-14A	NS	0.020 U
LC-16	0.020 U	0.2 U
LC-19A	0.02 U	0.020 U
LC-20	0.02 U	0.2 U
LC-24	0.02 U	0.2 U
LC-26	NS	0.2 U
LC-34	1.2	1.1
LC-41A	NS	0.20 U
LC-41B	0.02 U	2.0 U
LC-49	NS	0.40 U
LC-53	NS	0.14
LC-57	0.47	0.2 U
LC-61B	0.02 U	0.2 U
LC-64A	9.5 (8.8) J (J)	0.62
LC-64B	NS	0.2 (0.2) U (U)
LC-66B	NS	0.20 UJ
LC-111B	NS	0.2 U
LC-116B	NS	0.2 U
LC-122B	NS	0.2 U
LC-128	NS	0.020 U
LC-136A	2.3	4.7 J
LC-136B	NS	0.40 (0.40) U (U)
LC-137B	0.020 (0.020) U (U)	0.020 (0.020) U (U)
LC-137C	NS	0.2 U
LC-149C	NS	0.2 U
LC-167	0.02 U	0.2 U
MAMC-1	0.02 U	0.2 (0.2) U (U)
MAMC-6	0.02 U	0.2 U
PA-381	NS	0.020 U
PA-383	NS	0.2 U
T-04	NS	0.2 U
T-06	0.02 U	0.2 U
T-08	NS	0.020 U
T-10	NS	0.2 U
T-11B	NS	0.2 U
T-12B	0.2 U	0.2 U
T-13B	NS	0.2 (0.2) U (U)
<b>Wells Screened in Lower Aquifer</b>		
LC-21C	NS	0.2 U
LC-26D	NS	0.2 U
LC-35D	0.2 U	0.2 U
LC-40D	NS	0.2 U
LC-47D	0.2 U	0.2 U
LC-50D	0.2 U	0.2 U
LC-66D	NS	0.20 UJ
LC-67D	NS	0.20 (0.020) U (U)
LC-69D	0.02 U	0.020 U
LC-70D	0.02 U	0.2 U
LC-71D	NS	0.2 U
LC-72D	NS	0.2 U
LC-73D	NS	0.020 U
LC-74D	NS	0.020 U
LC-75D	0.2 U	0.2 U
LC-76D	0.2 U	0.2 U
LC-77D	0.2 U	0.2 U
LC-126	NS	0.020 (0.020) U (U)
MAMC-3	0.02 U	0.2 U
MAMC-4	0.020 (0.020) U (U)	0.2 U
PS-13	0.02 U	0.2 U
<b>Surface Water Stations</b>		
SW-MC-1	NS	0.2 U
SW-MC-4	0.2 (0.2) U (U)	0.2 (0.2) U (U)
SW-MC-6	0.2 U	0.2 U

**Notes:**

Results in parentheses are for blind duplicate samples.  
September 1996 and September 1997 and later results are for EPA Method 8260 analyses;  
all other results are for EPA Method 8010 analyses.  
µg/L - microgram per liter  
J - estimated value  
NS - not sampled  
R - result rejected  
U - compound not detected above analytical reporting limit

**Table 10**  
**Extraction Well Sampling Results for Trichloroethene (mg/L)**

			First Year of Monitoring									
Well	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96
I-5 System Wells												
LX-1	10	11	17	NA	NA	NA	10	10 J	12	11	9.2	12
LX-2	21	23	29	19	15	19	12	18 J	29	21	18	21
LX-3	35 (36)	35	49	33	29	45	29	NA	NA	NA	30	40
LX-4	60	70	90	85	71	100	74	67 J	108	68	66	91 (93)
LX-5	120	96 (100)	150	NA	NA	NA	120 (120)	120 (120) J (J)	163 (163) J (none)	110 (110)	100 (110)	140
LX-6	120	97	160 (150)	120 (100)	93 (95)	NA	120	110 J	175	110	110	130
LX-7	95	90	130	100	83	130 (130)	88	88 J	126	99	75	110
LX-8	78	83	100	83	66	NA	72	72 J	102	69	61	89
LX-9	86	80	NA	NA	NA	NA	79	78 J	111	70	64	97
LX-10	87	72	85	86	67	NA	75	74 J	102	66	62	89
LX-11	57	44	64	53	39	70	53	55 J	78	59	47	61
LX-12	28	24	36	29	25	42	31	34 J	47	30	27	NA
LX-13	2.7	2.0	3.1	2.6	2.2	3.1	2.8	3.2 J	4.7	4.1	3.8	4.6
LX-14	2.7	3.4	5.2	4.9	4.2	7.5	7.2	7.1 J	10	6.9	6.9	7.1
LX-15	0.29 (0.34) J (J)	0.87 J	1.6 (1.6)	1.3	1.4 (1.4)	NA	2.5	2.8 J	4.2	3.2 (2.8)	2.4	3.1
East Gate System Wells												
LX-16	120	150	190	150	140	220 (220)	160	160	95	150	NA	NA
LX-17	1,400	1,100	1,100	NA	NA	NA	720	660 J	705 J	630	570 (490)	680
LX-18	2,800	3,000	2,600	2,000 (1,900)	NA	NA	1,600	1,600	1,900	1,600	1,200	1,500
LX-19	130	110 J	NA	NA	NA	NA	110 (130)	120	163 J	120	110	140
LX-21	190 (230)	210 J	220 (230)	190	NA	NA	110	110 (110)	159	0.87 J	76	150 (160)
RW-1	140	NA	230	180	160	210	NA	140	216	150	120	NA

**Table 10 (Continued)**  
**Extraction Well Sampling Results for Trichloroethene (mg/L)**

Well	Second Year of Monitoring					Third Year of Monitoring			
	Nov-96	Feb-97	May-97	Sep-97		Dec-97	Mar-98	Jun-98	Sep-98
<b>I-5 System Wells</b>									
LX-1	12	12	10	12		12	11	11	9.7
LX-2	18	20	18	18		18	16	15	16
LX-3	30	33	32	34		34	32	30	35
LX-4	72	76 (77)	61	79		64	66	67	NA
LX-5	130 (130)	120	100 (95)	120 (120)		110 (120)	100 (95)	87 (88)	95 (96)
LX-6	120	130	98	120		120	110	96	120
LX-7	91	100	75	85		97	86	75	100
LX-8	75	80	64	69		67	73	68	75
LX-9	76	82	68	70		67	74	67	74
LX-10	55	71	55	62		57	64	55	56
LX-11	40	52	48	49		43	43	37	35
LX-12	22	32	28	28		24	25	20	20
LX-13	5.1	5.9	5.0	5.2		NA	NA	4.5	5.9
LX-14	5.6	7.3	6.7	3		6.4	6.1	5.3	5.6
LX-15	2.6 (2.4)	3.5	3.5	3.3		3.3	3.0	2.7	3.1
<b>East Gate System Wells</b>									
LX-16	160	200 (200)	NA	180		150 (170)	160 (160)	150 (150)	NA
LX-17	720	630	550	580 (620)		650	470	450	690
LX-18	1,100	1,200	1,100	880		740	700	700	310 (1,000)
LX-19	120	NA	110	100		110	110	110	120
LX-21	110	98 J	65 (73)	110		120	110	110	150
RW-1	NA	NA	150	190		170	180	160	NA

**Table 10 (Continued)**  
**Extraction Well Sampling Results for Trichloroethene (mg/L)**

Well	Fourth Year of Monitoring				Fifth Year of Monitoring			
	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00
<b>I-5 System Wells</b>								
LX-1	11 J	13	9.8	14	11	11	9.2	7.6
LX-2	14	14	12	11	15	13	13	9.8
LX-3	35	32	25	24	24	22	20	20
LX-4	NA	92	57	59	60	51	50	56
LX-5	96 (98)	NA	99 (100)	100 (100)	100 (100)	90 (87)	100 (100)	85 (82)
LX-6	120	120 (130)	94	92	93	88	100	89
LX-7	110 J	45	83	83	88	84	96	83
LX-8	83	86	74	72	77	76	89	NA
LX-9	79 J	83	69	69	68	68	80	67
LX-10	67	78	63	61	63	110	77	64
LX-11	28 J	50	45	40	36	43	51	35
LX-12	17	33	27	23	22	30	36	23
LX-13	5.1	5.4	6.8	NA	NA	NA	NA	5.3
LX-14	5.0	6.0	7.5	7.3	6.8	8.2	7.6	5.8
LX-15	2.5	3.5	4.4	4.0	3.4	4.3	4.5	2.9
<b>East Gate System Wells</b>								
LX-16	NA	NA	NA	NA	NA	NA	NA	NA
LX-17	870	580	390	480	550	460	400	470
LX-18	1,000 (1,000)	980 (940)	550 (530)	550 (520)	800 (780)	750 (770)	580	670 (640)
LX-19	200	140	120	100	110	100	92	88
LX-21	130	110	93	21	110	97	96	100
RW-1	NA	NA	NA	NA	NA	NA	NA	NA

**Table 10 (Continued)**  
**Extraction Well Sampling Results for Trichloroethene (mg/L)**

Well	Sixth Year of Monitoring				Seventh Year of Monitoring	
	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
<b>I-5 System Wells</b>						
LX-1	9.8 J	11	10	10	NS	8.2
LX-2	12 J	14	13	11	NS	11
LX-3	27 J	23	27	21	NS	23
LX-4	72 J	58	54	52	NS	54
LX-5	110 (100) J (J)	96 (86)	79 (92)	72 (74)	NS	69 (76)
LX-6	110 J	82	79	78	NS	NS
LX-7	100 J	79	72	76	NS	73
LX-8	NA	73	82	68	NS	71
LX-9	78 J	61	55	54	NS	61
LX-10	71 J	43	39	46	NS	59
LX-11	32 J	26	21	20	NS	29
LX-12	20 J	20	16	13	NS	23
LX-13	5.8 J	6.5	5.6	5.3	NS	NS
LX-14	5.4 J	5.9	4.7	4.2	NS	5.8
LX-15	3.1 J	3.0	2.4	2.3	NS	3.4
<b>East Gate System Wells</b>						
LX-16	NA	NA	120	140	150	330
LX-17	580 J	600 J	1100	780	2,100	1,100 (1,100)
LX-18	770 (760) J (J)	820 (780)	1,000 (1,100)	1,200 (1,200)	2,600 (2,400)	NS
LX-19	110 J	120	130	160	250	52
LX-21	100 J	92	96	100	170	120
RW-1	NA	NA	150	150	240	550

**Notes:**

Results in parentheses are for blind duplicate samples.  
November 1995, February 1996, May 1996, August 1996, and all post-August 1996 quarterly sampling results are for EPA Method 8260 analyses. All other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NA - well was not operating at the time of sampling

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 11**  
**Extraction Well Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Startup				First Year of Monitoring								
Well	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96
I-5 System Wells												
LX-1	1.7	1.6	2.2	NA	NA	NA	1.9	1.8	2.1	1.5	1.1	1.6
LX-2	3.9	3.7	3.9	3.4	2.7	2.8	1.4	3	3.4	3.1	2.4	2.6
LX-3	3.9 (4.4)	3.3	3.7	3	2.0 J	3.7	2.3	NA	NA	NA	2.2	2.8
LX-4	8.3	7.9	9.1	7.8	7.6	8.7	6.9	6.7	8.8	6.9	6.6	7.1(7.4)
LX-5	12	11(14)	15	NA	NA	NA	10 (9.8)	9.6 (9.6)	13 (13)	9.8 (9.6)	8.8(8.9)	11
LX-6	15	13	16 (16)	14	12 (12)	NA	12	12	16	12	12	12
LX-7	9.6	11	14	13 (14)	11	13 (14)	11	10	14	11	10	11
LX-8	11	12	13	12	10	NA	10	8.6	12	8.5	7.1	9.7
LX-9	12	10	NA	NA	NA	NA	11	8.4	12	8.2	7.9	9.9
LX-10	12	7.9	8.8	10	8.8	NA	10	8.6	12	9.7	10	9.2
LX-11	6.3	6.0	6.6	6.7	6.0 J	10	7.5	6.6	9.5	7.0	6.5	6.6
LX-12	5.4	3.6	3.6	4.0	4.1 J	5.8	5.6	6.2	5.6	3.8	3.7	NA
LX-13	0.22 J	1.0 U	0.49 J	0.42 J	0.41 J	0.66	0.5 J	0.76 J	1.1	0.9 J	0.73 J	1.1
LX-14	0.31 J	0.34 (0.24) J (D)	0.56	0.71 J	0.51 J	1.2	0.97 J	1.1	1.2	0.81 J	0.67 J	0.8
LX-15	1.0 (1.0) U (U)	1 U	0.17 (0.17) J (J)	1.0 U	1.0 (1.0) UJ (U)	NA	0.27 J	0.36 J	0.5 (0.5)	0.21 (1.0) J (U)	1.0 U	0.4 J
East Gate System Wells												
LX-16	19	27	43	30	19	31 (30)	28	30	43	28	NA	NA
LX-17	140	98	95	NA	NA	NA	64	81	63	60	58(53)	57
LX-18	140	120	100	150 (160)	NA	NA	170	230	260	230	200	220
LX-19	34	41	NA	NA	NA	NA	49 (40)	50	45	35	34	37
LX-21	25 (24)	28 (24)	37 (37)	31	NA	NA	15	14 (15)	18	0.5 J	12	16 (16)
RW-1	26	NA	36	30	32	31	NA	24	29	26	25	NA

**Table 11 (Continued)**  
**Extraction Well Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	Second Year of Monitoring				Third Year of Monitoring			
	Nov-96	Feb-97	May-97	Sep-97	Dec-97	Mar-98	Jun-98	Sep-98
<b>I-5 System Wells</b>								
LX-1	1.6	1.5	1.5	1.4	1.3	1.3	1.3	1.2
LX-2	2.5	2.3	2.2	2.1	1.9	1.7	1.5	1.3
LX-3	3.2	2.9	3.4	3.6	3.6	3.6	3.6	3.1
LX-4	7.3	6.4 (6.4)	6.4	6.4	5.8	5.2	6.0	NA
LX-5	12 (12)	9.3	7.9 (8.2)	9 (10)	9.8 (10)	9.8 (9.8)	9.5 (9.6)	8.2 (8.4)
LX-6	13	13	10	9.9	10	11	10	9.9
LX-7	11	10	9.8	9.5	8.7	8.1	7.4	8
LX-8	9.8	8.6	8.1	7.6	6.2	5.1	4.4	3.8
LX-9	9.1	8.3	8.3	8	6.3	6.0	5.7	5.2
LX-10	5.4	7.5	7.8	7.2	4.7	5.2	4.8	2.5
LX-11	4.0	6.0	6.1	5.0	3.8	4.5	3.6	2.3
LX-12	2.2	3.6	3.2	2.2	1.7	2.1	1.5	0.9
LX-13	1.2	1.2	1.2	1.3	NA	NA	1.2	1.4
LX-14	0.52 J	0.7	0.6	NA	0.4 J	0.6	0.4 J	0.4
LX-15	0.24 (0.21) J (J)	0.4 J	0.3 J	0.3 J	0.3 J	0.3 J	0.2 J	0.2
<b>East Gate System Wells</b>								
LX-16	43	40 (41)	NA	35	42 (42)	40 (38)	32 (32)	NA
LX-17	60	50	47	40 (41)	48	50	53	49
LX-18	190	160	190	130	130	140	150	48 (140)
LX-19	40	NA	28	26	28	27	21	16
LX-21	17	12	7.9 (6.7)	13	15	12	12	12
RW-1	NA	NA	26	33	35	37	27	NA

**Table 11 (Continued)**  
**Extraction Well Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	Fourth Year of Monitoring				Fifth Year of Monitoring			
	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00
<b>I-5 System Wells</b>								
LX-1	1.1	1.4	1.1	1.2	1.0	0.8	0.7	1.0 U
LX-2	1.2	1.0	1.0 J	1.3	1.1	0.8	0.9	1.0 U
LX-3	3.2	2.8	2.7	2.6	2.8	2.1	1.9	2.3
LX-4	NA	5.6	3.4	3.6	3.1	2.5	2.2	2.9
LX-5	6.5 (6.6)	NA	6.9 (6.5)	7.3 (7.3)	6.9 (6.9)	5.5 (5.4)	5.6 (5.5)	5.6 (5.3)
LX-6	8.6	8.1 (9.0)	7.1	7.3	7.0	5.9	6.0	5.5
LX-7	10	4.2	5.7	4.8	5.7	5.0	4.9	4.3
LX-8	3.5	3.5	3.6	3.3	3.4	3.2	3.3	NA
LX-9	4.8	4.7	4.4	3.8	4.2	4.0	4.0	4.0
LX-10	2.5	3.8	3.1	2.2	2.4	4.3	2.5	2.3
LX-11	1.9	3.8	3.0	2.3	2.1	2.3	2.1	1.8
LX-12	1.0 U	3.6	2.7	1.6	1.4	2.1	2.0	1.2
LX-13	1.2	1.3	1.4	NA	NA	NA	NA	1.0
LX-14	0.3	0.6	0.6	0.4	0.4	0.7	0.7	0.4
LX-15	0.2 U	0.3	0.4	0.3	0.2	0.4	0.4	0.2
<b>East Gate System Wells</b>								
LX-16	NA	NA	NA	NA	NA	NA	NA	NA
LX-17	71	48	42	33	48	42	39	41
LX-18	190 (180)	150 (150)	120 (120)	100 (98)	160 (160)	140 (140)	110	110 (110)
LX-19	36	18	15	10	18	12	9.2	9.2
LX-21	14	7.7	7.4	7.2	9.6	7.1	6.1	6.9
RW-1	NA	NA	NA	NA	NA	NA	NA	NA

**Table 11 (Continued)**  
**Extraction Well Sampling Results for cis-1,2-Dichloroethene (mg/L)**

Well	Sixth Year of Monitoring				Seventh Year of Monitoring	
	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
<b>I-5 System Wells</b>						
LX-1	0.6	0.7	0.6	0.4	NS	0.7
LX-2	0.8	0.8	0.7	0.6	NS	0.7
LX-3	2.6	2.3	2.4	2.0	NS	1.9
LX-4	3.5	2.9	2.8	2.6	NS	2.0
LX-5	6.4 (6.2)	5.6 (5.4)	5.1 (4.5)	4.4 (4.5)	NS	5.0 (4.4)
LX-6	6.0	5.2	4.7	4.3	NS	NS
LX-7	4.1	4.0	3.6	3.3	NS	3.9
LX-8	NA	2.7	2.2	1.9	NS	2.5
LX-9	4.0	3.1	2.8	2.5	NS	2.6
LX-10	2.1	1.3	1.3	1.4	NS	1.5
LX-11	1.4	1.2	1.2	1.1	NS	1.7
LX-12	0.8	1.0	0.8	0.8	NS	1.8
LX-13	1.0	1.0	0.8	0.7	NS	NS
LX-14	0.4	0.4	0.3	0.3	NS	0.5
LX-15	0.2	0.2	0.2 U	0.2 U	NS	0.3
<b>East Gate System Wells</b>						
LX-16	NA	NA	7.3	11	10	52
LX-17	60	54 J	54	69	270	200 (190)
LX-18	120 (110)	120 (110)	100 (120)	120 (120)	530 (590)	NS
LX-19	19	13	11	31	70	13
LX-21	8.7	7.8	7.5	11	24	15
RW-1	NA	NA	10	11	49	170

**Notes:**

Results in parentheses are for blind duplicate samples.  
November 1995, February 1996, May 1996, August 1996, and all post-August 1996 quarterly sampling results are for EPA Method 8260 analyses. All other results are for EPA Method 8010 analyses.  
µg/L - microgram per liter  
J - estimated value  
NA - well was not operating at the time of sampling  
NS - not sampled  
R - result rejected  
U - compound not detected above analytical reporting limit

**Table12**  
**Extraction Well Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Startup				First Year of Monitoring								
Well	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96
I-5 System Wells												
LX-1	0.24 J	0.26 J	0.50	NA	NA	NA	0.29 J	0.26 J	0.4	0.40 J	0.16 J	0.4
LX-2	1.7	1.9	1.9	1.3	1.1	0.96	0.68	1.4	1.9	1.9	1.0	1.4
LX-3	12 (11)	8.4	8.5	6.1	4.1	6.7	4.8 J	NA	NA	NA	4.6	6.1
LX-4	16	13	1.7	11	11	12	11 J	9.8	12	11	8.6	12 (10)
LX-5	27	17 (21)	26	NA	NA	NA	16 (16) J (J)	14 (14)	16 (16)	13 (14)	12 (12)	14
LX-6	12	9.3	13 (13)	13 (11)	10 (11)	NA	9.9 J	9.0	12	9.5	7.6	8.8
LX-7	3.3	3.4	3.8	3.3	2.5	2.1 (2.4)	2.2 J	1.4 J	2.2	2.4	1.3	2.0
LX-8	0.48 J	0.50 J	0.56 J	0.47 J	0.70	NA	0.33 J	1.5 U	0.4	0.35 J	0.18 J	0.5
LX-9	0.48 J	0.42 J	NA	NA	NA	NA	0.34 J	1.5 U	0.4	0.33 J	0.19 J	0.4
LX-10	0.34 J	0.20 J	0.8 U	0.24 J	0.52 J	NA	0.21 J	1.5 U	0.3	0.21 J	0.6 U	0.3 J
LX-11	0.42 J	0.29 J	0.8 U	0.35 J	0.43	0.44	0.30 J	1.5 U	0.4	0.58 J	0.22 UJ	0.4 J
LX-12	0.2 J	0.099 J	0.13 J	0.20 J	0.22 J	0.4 U	0.11 J	0.095 J	0.1	0.083 J	0.3 U	NA
LX-13	0.3 U	0.3 U	0.4 U	0.3 U	0.3 U	0.4 U	0.3 U	0.3 U	0.1	0.089 J	0.3 U	0.4 U
LX-14	0.3 U	0.3 U	0.4 U	0.3 U	0.3 U	0.4 U	0.3 U	0.3 U	0.4 U	0.3 U	0.3 U	0.4 U
LX-15	0.3 (0.3) U (U)	0.3 U	0.4 U	0.3 U	0.3 U	NA	0.3 U	0.3 U	0.4 (0.4) U (U)	0.3 (0.3) U (U)	0.3 U	0.4 U
East Gate System Wells												
LX-16	0.91	0.56 J	0.64 J	0.48 J	1.5	0.72 (0.70) J (J)	1.5 U	1.5 U	2 U	2.0	NA	NA
LX-17	12	9.8	20 U	NA	NA	NA	15 U	2.8 J	10 U	8.9	2.4 (3.0) J (U)	3.6
LX-18	6.0 U	6.0 U	20 U	6.0 (15) U (U)	NA	NA	15 U	15 U	20 U	15 U	15 U	8 U
LX-19	0.87	0.46 J	NA	NA	NA	NA	1.5 U	1.5 U	0.8 U	1.7	1.50 U	0.3 J
LX-21	2.2 (2.8)	1.2 (1.15) J (J)	0.92 (0.92)	0.81	NA	NA	1.5 U	1.5 (1.5) U (U)	2.0 U	0.3 U	0.30	0.4 (0.4) none (J)
RW-1	1.5 J	NA	1.2	0.96	1.0	0.64 J	NA	0.42 J	2.0 U	0.62 J	0.56 J	NA

**Table 12 (Continued)**  
**Extraction Well Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	Second Year of Monitoring				Third Year of Monitoring			
	Nov-96	Feb-97	May-97	Sep-97	Dec-97	Mar-98	Jun-98	Sep-98
<b>I-5 System Wells</b>								
LX-1	0.52	0.3 J	0.3 J	0.3 J	5.0	0.3 J	0.2 J	0.2
LX-2	1.1	1.0	0.9	0.7	0.9	0.7	0.5	1.0 U
LX-3	4.4	3.9	3.5	3.8	4.4	3.4	2.7	2.5
LX-4	9.8	7.8 (7.8)	7.0	7.3	8.3	5.5	5.3	NA
LX-5	16 (16)	9.3	6.5 (6.3)	6.5 (8.0)	8.4 (8.6)	6.1 (5.9)	4.2 (4.1)	3.5 (3.7)
LX-6	8.6	6.8	4.0	4.2	5.9	4.4	3.5	3.4
LX-7	2.4	1.6	1.1	1.1	1.3	1.0	0.7	0.9 J
LX-8	0.71	0.3 J	0.2 J	0.3 J	0.4 J	0.3 J	0.2 J	1.0 U
LX-9	0.66	0.3 J	0.3 J	0.3 J	0.4	0.3 J	0.2 J	1.0 U
LX-10	0.38 J	0.2 J	0.2 J	0.4 U	0.2 J	0.2 J	0.4 U	1.0 U
LX-11	0.42 J	0.3 J	0.2 J	0.2 J	0.3 J	0.2 J	0.4 U	1.0 U
LX-12	0.22 J	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	1.0 U
LX-13	0.24 J	0.4 U	0.4 U	0.4 U	NA	NA	0.4 U	1.0 U
LX-14	0.17 J	0.4 U	0.4 U	NA	0.4 U	0.4 U	0.4 U	0.2 U
LX-15	0.19 (0.14) J (J)	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.2 U
<b>East Gate System Wells</b>								
LX-16	1.3	2.0 (0.5) U	NA	0.8 U	0.5 (0.5)	0.4 (0.4) J (J)	0.3 (0.3) J (J)	NA
LX-17	9.9	2.5	1.6 J	2.3 (2.5) J (J)	4.0	2.8	2.9	5.0 U
LX-18	15 U	8.0 U	8.0 U	8.0 U	4.0 U	2.0 U	2.0 U	5.0 (5.0) U (U)
LX-19	0.97 J	NA	0.8 U	0.8 U	0.2 J	0.4 U	0.4 U	1.0 U
LX-21	0.65	0.2 J	0.4 (0.8) U(U)	0.4 U	0.2 J	0.4 U	0.4 U	1.0 U
RW-1	NA	NA	0.8 U	0.5 J	0.8	0.5	0.4	NA

**Table 12 (Continued)**  
**Extraction Well Sampling Results for 1,1,1-Trichloroethane (mg/L)**

Well	Fourth Year of Monitoring				Fifth Year of Monitoring			
	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00
<b>I-5 System Wells</b>								
LX-1	1.0 U	1.0 U	1.0 U	0.2	0.2 U	0.2 U	0.2 U	1.0 U
LX-2	1.0 U	1.0 U	1.0 U	0.4	0.3	0.3	0.2	1.0 U
LX-3	2.4	1.0 U	1.7	1.6	1.5	1.2	1.3	1.2
LX-4	NA	4.1	3	2.9	2.5	1.8	2.3	2.7
LX-5	3.4 (3.4)	NA	3.9 (3.8)	4.3 (4.2)	3.4 (3.4)	2.2(2.2)	2.8 (2.8)	2.2 (2.1)
LX-6	3.4	3.2 (3.7)	2.9	2.8	2.8	1.8	2.7	2.1
LX-7	4.5	1.0 U	1.0	1.0 J	1.1	0.8 J	1.0	0.8 J
LX-8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA
LX-9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-10	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-11	1.0 U	1.0 U	1.0 U	1.0 U	1.0	1.0 U	1.0 U	0.6 J
LX-12	1.0 U	1.0 U	1.0 U	1.1	1.7	1.0 U	1.0 U	1.1
LX-13	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	0.4
LX-14	0.2 U	0.2 U	0.2 U	6.9	7.7	2.7	2.2	1.9
LX-15	0.2 U	0.2 U	0.2 U	7.7	7.9	3.1	2.5	1.4
<b>East Gate System Wells</b>								
LX-16	NA	NA	NA	NA	NA	NA	NA	NA
LX-17	10 U	10 U	10 U	5 U	5.0 U	10 U	5.0 U	5.0 U
LX-18	3 (10) U(U)	10 (10) U(U)	10 (10) U (U)	10 (10) U (U)	5.0 (5.0) U (U)	10 (10) U(U)	10 U	5.0 (5.0) U (U)
LX-19	1.0 U	3.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-21	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
RW-1	NA	NA	NA	NA	NA	NA	NA	NA

**Table 12 (Continued)**  
**Extraction Well Sampling Results for 1,1,1-Trichloroethane (µg/L)**

Well	Sixth Year of Monitoring				Seventh Year of Monitoring	
	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
<b>I-5 System Wells</b>						
LX-1	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-2	0.2 U	0.3	0.3	0.2 U	NS	0.2
LX-3	1.5	1.4	1.6	1.2	NS	1.2
LX-4	2.9	2.9	2.9	2.6	NS	2.2
LX-5	2.5 (2.1)	2.7 (2.6)	2.1 (1.7)	1.6 (1.6)	NS	2.0 (1.0) U (U)
LX-6	2.1	1.8	1.0 U	1.4	NS	NS
LX-7	2.0 U	1.0 U	1.0 U	1.0 U	NS	2.0 U
LX-8	NA	1.0 U	1.0 U	1.0 U	NS	2.0 U
LX-9	2.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U
LX-10	2.0 U	1.0 U	1.0 U	0.6 U	NS	1.0 U
LX-11	1.0 U	1.0 U	1.0 U	0.6 U	NS	0.4 U
LX-12	1.3	1.0	0.7	0.8	NS	0.4 U
LX-13	0.5	0.5	0.4	0.2	NS	NS
LX-14	1.6	1.3	0.8	0.8	NS	0.6
LX-15	1.3	1.0	0.7	0.6	NS	0.6
<b>East Gate System Wells</b>						
LX-16	NA	NA	1.0 U	1.0 U	1.0 U	1.0 U
LX-17	10 U	3.0 UJ	3.0 U	10 U	2.4	2.3 (2.3)
LX-18	20 (20) U (U)	10 (10) U (U)	5.0 (10) U (U)	10 (10) U (U)	50 (10) U (U)	NS
LX-19	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U
LX-21	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U
RW-1	NA	NA	1.0 U	1.0 U	10 U	1.0 U

**Notes:**

Results in parentheses are for blind duplicate samples.

November 1995, February 1996, May 1996, August 1996, and all post-August 1996 quarterly sampling results are for

EPA Method 8260 analyses. All other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NA - well was not operating at the time of sampling

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 13**  
**Extraction Well Sampling Results for Tetrachloroethene (mg/L)**

First Year of Monitoring												
Well	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96
I-5 System Wells												
LX-1	0.3 U	0.3 U	0.12 J	NA	NA	NA	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.1 J
LX-2	0.12 J	0.13 J	0.2 J	0.11 J	0.14 J	0.5 U	0.3 U	0.3 U	0.10 J	0.3 U	0.3 U	0.2 J
LX-3	0.3 (0.3) U (UJ)	0.3 U	0.5 U	0.3 U	0.3 U	0.10 J	0.3 U	NA	NA	NA	0.3 U J	0.1 J
LX-4	0.1 J	0.6 U	1.0 U	0.3 U	0.6 U	1.0 U	0.6 U	0.6 U	1.0 U	0.6 U	0.6 U J	0.1 (0.1) J (J)
LX-5	0.6 U	0.6 (0.10) U (J)	1.0 U	NA	NA	NA	1.5 (1.5) U (U)	1.5 (1.5) U (U)	2.5 (0.5) U (U)	1.5 (1.5) U (U)	1.5 (1.5) U (U)	0.5 U
LX-6	0.23 J	0.6 U	0.3 J	0.27 (0.6) J (U)	0.6 (0.6) U (UJ)	NA	1.5 U	1.5 U	2.5 U	1.5 U	1.5 U J	0.3 J
LX-7	0.33 J	0.25 J	0.40 J	0.26 J	0.29 J	1.0 (2.5) U (U)	0.24 J	1.5 U	0.50 J	0.33 J	0.25 J	0.5 J
LX-8	0.57 J	0.6 U	0.66 J	0.44 J	0.40 J	NA	0.38 J	1.5 U	0.6 J	0.40 J	0.29 J	0.7
LX-9	0.39 J	0.22 J	NA	NA	NA	NA	0.33 J	1.5 U	0.50 J	0.27 J	0.21 J	0.5
LX-10	0.21 J	0.6 U	1.0 U	0.6 U	0.6 UJ	NA	0.6 U	1.5 U	0.3 J	0.21 J	0.6 U J	0.3 J
LX-11	0.6 U	0.6 U	1.0 U	0.6 U	0.3 U	0.10 J	0.6 U	1.5 U	1.0 U	0.6 U	0.6 U J	0.1 J
LX-12	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.10 J	0.3 U	0.3 U	NA
LX-13	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.5 U
LX-14	0.3 U	0.3 (0.3) U (U)	0.5 U	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U	0.5 U	0.3 U	0.3 U J	0.5 U
LX-15	0.3 (0.3) U (U)	0.3 U	0.5 (0.5) U (U)	0.3 U	0.3 (0.3) UJ (U)	NA	0.3 U	0.3 U	0.5 (0.5) U (U)	0.3 U	0.3 U J	0.5 U
East Gate System Wells												
LX-16	0.6 U	1.5 U	1.0 U	0.26 J	1.5 U	1.0 (1.0) U (U)	1.5 U	1.5 U	2.5 U	1.5 U	NA	NA
LX-17	3.0 U	3.0 U	25 U	NA	NA	NA	15 U	6 U	12 U	6.0 (3.0) U (U)	6.0 (3.0) U (U)	2.5 U
LX-18	6.0 U	6.0 U	25 U	6.0 (15) U (U)	NA	NA	15 U	15 U	0.5 U	15 U	15 U	10 U
LX-19	0.6 U	1.5 U	NA	NA	NA	NA	1.5 (15) U (U)	1.5 U	1.0 U	1.5 U	1.5 U	0.10 J
LX-21	0.6 (0.6) U (U)	1.5 (1.5) U (U)	1.0 (1.0) U (U)	0.6 U	NA	NA	1.5 U	1.5 (1.5) U (U)	2.5 U	0.3 U	0.3 U	0.5 (0.5) U (U)
RW-1	0.3 U	NA	1.0 U	0.19 J	0.6 U	1.0 U	NA	1.5 U	2.5 U	1.5 U	0.6 U	NA

**Table 13 (Continued)**  
**Extraction Well Sampling Results for Tetrachloroethene (mg/L)**

Well	Second Year of Monitoring				Third Year of Monitoring			
	Nov-96	Feb-97	May-97	Sep-97	Dec-97	Mar-98	Jun-98	Sep-98
<b>I-5 System Wells</b>								
LX-1	0.54	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 U
LX-2	0.36	0.1 J	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U	1.0 U
LX-3	0.78	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.0 U
LX-4	0.23 J	0.5 (0.5) U (U)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
LX-5	1.5 (0.95) U (J)	0.5 U	1.0 (1.0) U (U)	1.0 (0.5) U (U)	0.5 (0.5) U (U)	0.5 (0.5) U (U)	0.5 (0.5) U (U)	1.0 (1.0) U (U)
LX-6	0.96 J	0.3 J	0.2 J	1.0 U	0.3 J	0.3 J	0.3 J	1.0 U
LX-7	0.62	0.4 J	0.3 J	0.4 J	0.4 J	0.4 J	0.3 J	1.0 U
LX-8	0.68	0.5	0.5 J	0.5 J	0.5	0.6	0.5	1.0 U
LX-9	0.77	0.4 J	0.4 J	0.3 J	0.3 J	0.4 J	0.3 J	1.0 U
LX-10	0.35 J	0.3 J	0.3 J	0.3 J	0.2 J	0.3 J	0.3 J	1.0 U
LX-11	0.25 J	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.0 U
LX-12	0.10 J	0.1 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.0 U
LX-13	0.3 U	0.5 U	0.5 U	0.5 U	NA	NA	0.5 U	1.0 U
LX-14	0.3 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.2 U
LX-15	0.3 (0.3) U (U)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 U
<b>East Gate System Wells</b>								
LX-16	1.5 U	2.5 (0.5) U (J)	NA	1.0 U	0.3 (0.3) J (J)	0.4 (0.4) J (J)	0.5 (0.5) U (U)	NA
LX-17	6.0 U	2.5 U	5.0 U	5.0 (5.0) U (U)	0.5 U	2.5 U	2.5 U	5.0 U
LX-18	15 U	10 U	10 U	10 U	0.5 U	2.5 U	2.5 U	5.0 (5.0) U (U)
LX-19	0.98	NA	1.0 U	1.0 U	0.5 U	0.5 U	0.5 U	1.0 U
LX-21	0.75	0.5 U	0.5 (1.0) U (U)	0.5 U	0.5 U	0.5 U	0.5 U	1.0 U
RW-1	NA	NA	1.0 U	1.0 U	0.3 J	0.3 J	0.2 J	NA

**Table 13 (Continued)**  
**Extraction Well Sampling Results for Tetrachloroethene (mg/L)**

Well	Fourth Year of Monitoring				Fifth Year of Monitoring			
	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00
<b>I-5 System Wells</b>								
LX-1	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
LX-2	1.0 U	1.0 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
LX-3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-4	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-5	1.0 (1.0) U (U)	NA	1.0 (1.0) U	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)
LX-6	1.0 U	1.0 (1.0) U (U)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-7	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA
LX-9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-10	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-11	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-12	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-13	0.2 U	0.2 U	0.2 U	NA	NA	NA	0.2 U	0.2 U
LX-14	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.2 U
LX-15	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
<b>East Gate System Wells</b>								
LX-16	NA	NA	NA	NA	NA	NA	NA	NA
LX-17	10 U	10 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
LX-18	3.0 (10) U (U)	10 U	10 (10) U (U)	10 (10) U (U)	5.0 (5.0) U (U)	10 (10) U (U)	10 U	5.0 (5.0) U (U)
LX-19	1.0 U	3.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-21	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
RW-1	NA	NA	NA	NA	NA	NA	NA	NA

**Table 13**  
**Extraction Well Sampling Results for Tetrachlorethene (µg/L)**

Well	Sixth Year of Monitoring				Seventh Year of Monitoring	
	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
<b>I-5 System Wells</b>						
LX-1	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-2	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-3	0.6 U	1.0 U	0.6 U	0.6 U	NS	0.6 U
LX-4	2.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U
LX-5	2.0 (2.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	NS	2.0 (1.0) U (U)
LX-6	2.0 U	1.0 U	1.0 U	1.0 U	NS	NS
LX-7	2.0 U	1.0 U	1.0 U	1.0 U	NS	2.0 U
LX-8	NA	1.0 U	1.0 U	1.0 U	NS	2.0 U
LX-9	2.0 U	1.0 U	1.0 U	1.0 U	NS	1.0 U
LX-10	2.0 U	1.0 U	1.0 U	0.6 U	NS	1.0 U
LX-11	1.0 U	1.0 U	1.0 U	0.6 U	NS	0.4 U
LX-12	0.6 U	0.6 U	0.4 U	0.2 U	NS	0.4 U
LX-13	0.2 U	0.2 U	0.2 U	0.2 U	NS	NS
LX-14	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-15	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
<b>East Gate System Wells</b>						
LX-16	NA	NA	1.0 U	1.0 U	1.0 U	1.0 U
LX-17	10 U	3.0 UJ	3.0 U	10 U	1.0 U	0.5 (0.5)
LX-18	20 (20) U (U)	10 (10) U (U)	5.0 (10) U (U)	10 (10) U (U)	50 (10) U (U)	NS
LX-19	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U
LX-21	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.2 U
RW-1	NA	NA	1.0 U	1.0 U	10 U	1.0 U

**Notes:**

Results in parentheses are for blind duplicate samples.  
November 1995, February 1996, May 1996, August 1996, and all post-August 1996 quarterly sampling results are for EPA Method 8260 analyses. All other results are for EPA Method 8010 analyses.

µg/L - microgram per liter

J - estimated value

NA - well was not operating at the time of sampling

NS - not sampled

R - result rejected

U - compound not detected above analytical reporting limit

**Table 14**  
**Extraction Well Sampling Results for Vinyl Chloride (mg/L)**

Startup				First Year of Monitoring								
Well	Sep-95	Oct-95	Nov-95	Dec-95	Jan-96	Feb-96	Mar-96	Apr-96	May-96	Jun-96	Jul-96	Aug-96
I-5 System Wells												
LX-1	1.8 U	1.8 U	0.4 U	NA	NA	NA	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U
LX-2	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U
LX-3	1.8 U	1.8 U	0.4 U	1.8 U	3.6 U	0.4 U	1.8 U	NA	NA	NA	1.8 U	0.4 U
LX-4	1.8 U	3.6 U	0.8 U	1.8 U	3.6 U	0.8 U	3.6 U	3.6 U	0.8 U	3.6 U	3.6 U	0.4 (0.4) U (U)
LX-5	3.6 U	3.6 (1.8) U (U)	0.8 U	NA	NA	NA	9.0 (9.0) U (U)	9.0 (9.0) U (U)	2.0 (0.4) U (U)	9.0 (1.8) U (U)	9.0 (9.0) U (U)	0.4 U
LX-6	3.6 U	3.6 U	0.8 U	3.6 (3.6) U (U)	3.6 (3.6) U (U)	NA	9.0 U	9.0 U	2.0 U	9.0 U	9.0 U	0.4 U
LX-7	3.6 U	3.6 U	0.8 U	3.6 U	3.6 U	0.8 (2.0) U (U)	3.6 U	9.0 U	0.8 U	3.6 U	3.6 U	0.4 U
LX-8	3.6 U	3.6 U	0.8 U	3.6 U	3.6 U	NA	3.6 U	9.0 U	0.8 U	3.6 U	3.6 U	0.4 U
LX-9	3.6 U	3.6 U	NA	NA	NA	NA	3.6 U	9.0 U	0.8 U	3.6 U	3.6 U	0.4 U
LX-10	3.6 U	3.6 U	0.8 U	3.6 U	3.6 U	NA	3.6 U	9.0 U	0.8 U	3.6 U	3.6 U	0.4 U
LX-11	3.6 U	3.6 U	0.8 U	3.6 U	1.8 U	0.4 U	3.6 U	9.0 U	0.8 U	3.6 U	3.6 U	0.4 U
LX-12	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	NA
LX-13	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U
LX-14	1.8 U	1.8 (1.8) U (U)	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U	1.8 U	1.8 U	0.4 U
LX-15	1.8 (1.8) U (U)	1.8 U	0.40 (0.40) U (U)	1.8 U	1.8 (1.8) U (U)	NA	1.8 U	1.8 U	0.4 (0.4) U (U)	1.8 U	1.8 U	0.4 U
East Gate System Wells												
LX-16	3.6 U	9.0 U	0.8 U	3.6 (3.6) U (U)	9.0 U	0.8 (0.8) U (U)	9.0 U	9.0 U	2.0 U	9.0 U	NA	NA
LX-17	18 U	18 U	20.00 U	NA	NA	NA	9.0 U	36 U	10 U	36 U	36 (18) U (U)	0.6 J
LX-18	36 U	36 U	20 U	36 (90) U (U)	NA	NA	9.0 U	9.0 U	0.4 U	9.0 U	9.0 U	8.0 U
LX-19	3.6 U	9.0 U	NA	NA	NA	NA	9.0 (9.0) U (U)	9.0 U	0.8 U	9.0 U	9.0 U	0.4 U
LX-21	3.6 (3.6) U (U)	9.0 (9.0) U (U)	0.8 (0.8) U (U)	3.6 U	NA	NA	9.0 U	9.0 (9.0) U (U)	2.0 U	1.8 U	1.8 U	0.4 (0.4) U (U)
RW-1	1.8 U	NA	0.8 U	1.8 U	3.6 U	0.8 U	NA	9.0 U	2.0 U	9.0 U	3.6 U	NA

**Table 14 (Continued)**  
**Extraction Well Sampling Results for Vinyl Chloride (mg/L)**

Well	Second Year of Monitoring				Third Year of Monitoring			
	Nov-96	Feb-97	May-97	Sep-97	Dec-97	Mar-98	Jun-98	Sep-98
<b>I-5 System Wells</b>								
LX-1	1.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.2 U
LX-2	1.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-3	1.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-4	3.6 U	0.4 (0.4) U (U)	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	NA
LX-5	9.0 (9.0) U (U)	0.4 U	0.8 (0.8) U (U)	0.8 (0.4) U (U)	0.4 (0.4) U (U)	0.4 (0.4) U (U)	0.4 (0.4) U (U)	2.0 (2.0) U (U)
LX-6	9.0 U	0.4 U	0.8 U	0.8 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-7	3.6 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-8	3.6 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-9	3.6 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-10	3.6 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-11	3.6 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-12	1.8 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-13	1.8 U	0.4 U	0.4 U	0.4 U	NA	NA	0.4 U	2.0 U
LX-14	1.8 U	0.4 U	0.4 U	NA	0.4 U	0.4 U	0.4 U	0.2 U
LX-15	1.8 (1.8) U (U)	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.2 U
<b>East Gate System Wells</b>								
LX-16	9.0 U	2.0 (0.4) U (U)	NA	0.8 U	0.4 (0.4) U (U)	0.4 (0.4) U (U)	0.4 (0.4) U (U)	NA
LX-17	36 U	2.0 U	4.0 U	4.0 (4.0) U (U)	4.0 U	2.0 U	1.1 J	10 U
LX-18	90 U	8.0 U	8.0 U	8.0 U	4.0 U	2.0 U	2.0 U	10 (10) U (U)
LX-19	9.0 U	NA	0.8 U	0.8 U	0.4 U	0.4 U	0.4 U	2.0 U
LX-21	3.6 U	0.4 U	0.4 (0.8) U (U)	0.4 U	0.4 U	0.4 U	0.4 U	2.0 U
RW-1	NA	NA	0.8 U	0.8 U	0.4 U	0.4 U	0.4 U	NA

**Table 14 (Continued)**  
**Extraction Well Sampling Results for Vinyl Chloride (mg/L)**

Well	Fourth Year of Monitoring				Fifth Year of Monitoring			
	Dec-98	Mar-99	Jun-99	Sep-99	Dec-99	Mar-00	Jun-00	Sep-00
<b>I-5 System Wells</b>								
LX-1	2.0 U	1.0 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
LX-2	2.0 U	1.0 U	1.0 U	0.2 U	0.2 U	0.2 U	0.2 U	1.0 U
LX-3	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-4	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-5	2.0 (2.0) U (U)	NA	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)
LX-6	2.0 U	1.0 (1.0) U (U)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-7	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-8	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA
LX-9	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-10	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-11	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-12	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-13	0.2 U	0.2 U	0.2 U	NA	NA	NA	NA	0.2 U
LX-14	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
LX-15	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
<b>East Gate System Wells</b>								
LX-16	NA	NA	NA	NA	NA	NA	NA	NA
LX-17	20 U	10 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U
LX-18	6.0 (20) U (U)	10 (10) U (U)	10 (10) U (U)	10 (10) U (U)	5.0 (5.0) U (U)	10 (10) U (U)	10 U	5.0 (5.0) U (U)
LX-19	2.0 U	3.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
LX-21	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
RW-1	NA	NA	NA	NA	NA	NA	NA	NA

**Table 14 (Continued)**  
**Extraction Well Sampling Results for Vinyl Chloride (µg/L)**

Well	Sixth Year of Monitoring				Seventh Year of Monitoring	
	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
<b>I-5 System Wells</b>						
LX-1	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-2	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-3	0.6 U	1.0 U	0.6 U	0.02 U	NS	0.020 U
LX-4	2.0 U	1.0 U	1.0 U	0.02 U	NS	0.20 U
LX-5	2.0 (2.0) U (U)	1.0 (1.0) U (U)	1.0 (1.0) U (U)	0.20 (20) U (U)	NS	0.20 (0.20) U (U)
LX-6	2.0 U	1.0 U	1.0 U	0.2 U	NS	NS
LX-7	2.0 U	1.0 U	1.0 U	0.2 U	NS	0.20 U
LX-8	NA	1.0 U	1.0 U	0.2 U	NS	0.020 U
LX-9	2.0 U	1.0 U	1.0 U	0.2 U	NS	0.020 U
LX-10	2.0 U	1.0 U	1.0 U	0.2 U	NS	0.020 U
LX-11	1.0 U	1.0 U	1.0 U	0.2 U	NS	0.4 U
LX-12	0.6 U	0.6 U	0.4 U	0.2 U	NS	0.4 U
LX-13	0.2 U	0.2 U	0.2 U	0.2 U	NS	NS
LX-14	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
LX-15	0.2 U	0.2 U	0.2 U	0.2 U	NS	0.2 U
<b>East Gate System Wells</b>						
LX-16	NA	NA	1.0 U	0.2 U	0.02 U	0.20 U
LX-17	10 U	3.0 UJ	3.0 U	1.3	2.5	1.5 (1.4)
LX-18	20 (20) U (U)	10 (10) U (U)	5.0 (10) U (U)	0.21 (0.22)	0.51 (0.020) (U)	NS
LX-19	2.0 U	1.0 U	1.0 U	0.2 U	0.25	0.2 U
LX-21	2.0 U	1.0 U	1.0 U	0.2 U	0.090	0.2 U
RW-1	NA	NA	1.0 U	0.2 U	0.030	0.20 U

**Notes:**

Results in parentheses are for blind duplicate samples.  
November 1995, February 1996, May 1996, August 1996, and all post-August 1996 quarterly sampling results are for EPA Method 8260 analyses. All other results are for EPA Method 8010 analyses.  
µg/L - microgram per liter  
J - estimated value  
NA - well was not operating at the time of sampling  
NS - not sampled  
R - result rejected  
U - compound not detected above analytical reporting limit

**Table 15**  
**Sampling Schedule Summary - Upper Aquifer**  
**LOGRAM Network Optimization, Ft. Lewis, WA**

Well ID	Hydro-logic Unit	CURRENT (1) Sample Frequency	PROP RAM (2) Sample Frequency	REVISED (3) Sample Frequency	REVISED (3) Sample Schedule			
					Mar	Jun	Sep	Dec
LC-03	UV	Q	Q	Q	x	x	x	x
LC-05	UV	Q	A	A	x			
LC-06	UV	Q	S	S	x		x	
LC-14a	UV	Q	A	A	x			
LC-16	UV		Q	Q	x	x	x	x
LC-19a	UV	Q	Q	Q	x	x	x	x
LC-19b	UV	Q						
LC-19c	UV	Q						
LC-20	UV		Q	Q	x	x	x	x
LC-24	UV		Q	Q	x	x	x	x
LC-26	UV	Q	A	A	x			
LC-34	UV		Q	Q	x	x	x	x
LC-41a	UV	Q	A	A	x			
LC-44a	UV	Q						
LC-49	UV	Q	A	A	x			
LC-51	UV	Q						
LC-53	UV	Q	A	A	x			
LC-57	UV		Q	Q	x	x	x	x
LC-61b	UV		Q	Q	x	x	x	x
LC-64a	UV	Q	A	Q	x	x	x	x
LC-66a	UV	Q						
LC-66b	UV	Q	A	A	x			
LC-73a	UV	Q						
LC-108	UV	Q						
LC-132	UV	Q						
LC-136a	UV	Q	A	Q	x	x	x	x
LC-136b	UV	Q	A	A	x			
LC-137b	UV	Q	A	Q	x	x	x	x
LC-149c	UV	Q	A	A	x			
LC-149d	UV	Q						
LC-165	UV	Q						
LC-167	UV		Q	Q	x	x	x	x
PA-381	UV	Q	A	A	x			
PA-383	UV	Q	A	A	x			
T-04	UV	Q	A	A	x			
T-06	UV		Q	Q	x	x	x	x
T-08	UV	Q	S	S	x		x	
T-11b	UV		Q	Q	x	x	x	x
T-12b	UV	Q	Q	Q	x	x	x	x
T-13b	UV	Q	S	S	x		x	
FL2	UV			A	x			
FL3	UV		Q	Q	x	x	x	x
FL4b	UV		Q	Q	x	x	x	x
FL6	UV		Q	Q	x	x	x	x
"NEW-1"	UV		Q	Q	x	x	x	x
"NEW-2"	UV		Q	Q	x	x	x	x
"NEW-3"	UV		Q	Q	x	x	x	x
"NEW-4"	UV		Q	Q	x	x	x	x
"NEW-5"	UV		Q	Q	x	x	x	x
"NEW-6"	UV		Q	Q	x	x	x	x
LC-41b	LV		Q	Q	x	x	x	x
LC-64b	LV	Q	A	A	x			
LC-111b	LV	Q	A	A	x			
LC-116b	LV	Q	A	A	x			
LC-122b	LV	Q	A	A	x			

**Table 15 (Continued)**  
**Sampling Schedule Summary - Upper Aquifer, Continued**  
**LOGRAM Network Optimization, Ft. Lewis, WA**

Well ID	Hydro-logic Unit	CURRENT (1) Sample Frequency	PROP RAM (2) Sample Frequency	REVISED (3) Sample Frequency	REVISED (3) Sample Schedule			
					Mar	Jun	Sep	Dec
LC-128	LV	Q	A	A	x			
LC-137c	LV	Q	A	A	x			
T-10	LV		Q	Q	x	x	x	x
FL4a	LV		Q	Q	x	x	x	x
MAMC1	LV		Q	Q	x	x	x	x
MAMC6	LV		Q	Q	x	x	x	x
LX-1	EW	Q	A	A	x			
LX-2	EW	Q	A	A	x			
LX-3	EW	Q	A	A	x			
LX-4	EW	Q	A	A	x			
LX-5	EW	Q	A	A	x			
LX-6	EW	Q	A	A	x			
LX-7	EW	Q	A	A	x			
LX-8	EW	Q	A	A	x			
LX-9	EW	Q	A	A	x			
LX-10	EW	Q	A	A	x			
LX-11	EW	Q	A	A	x			
LX-12	EW	Q	A	A	x			
LX-13	EW	Q	A	A	x			
LX-14	EW	Q	A	A	x			
LX-15	EW	Q	A	A	x			
LX-16	EW	Q	Q	Q	x	x	x	x
LX-17	EW	Q	A	Q	x	x	x	x
LX-18	EW	Q	A	Q	x	x	x	x
LX-19	EW	Q	A	Q	x	x	x	x
LX-21	EW	Q	A	Q	x	x	x	x
RW-1	EW	Q	Q	Q	x	x	x	x
Total Quarterly wells:		59	28	35				
Total Semi-annual wells:		0	3	3				
Total Annual wells:		0	40	34				
Total # wells:		59	71	72	72	35	38	35
Total # samples:		236	158	180	72	35	38	35

Notes:

(1) Current sample frequency as of 24th Quarter (Sep 01)

(2) Proposed Remedial Action Monitoring sample frequency based on Draft LOGRAM NOR (May 01)

(3) Revised sample frequency based on USEPA & USGS comments received on Draft LOGRAM NOR

\*NEW-X\* wells have not yet been installed as of Nov 01

UV=Upper Vashon, LV=Lower Vashon, EW=(Vashon) Extraction Well;

Q=Quarterly, S=Semi-annually, A=Annually

NA=Not Applicable; bladder pump not needed for sampling

**Table 15 (Continued)**  
**Sampling Schedule Summary - Lower Aquifer**  
**LOGRAM Network Optimization, Ft. Lewis, WA**

Well ID	Hydro-logic Unit	CURRENT (1) Sample Frequency	PROP RAM (2) Sample Frequency	REVISED (3) Sample Frequency	REVISED (3) Sample Schedule			
					Mar	Jun	Sep	Dec
LC-21c	SS	Q	A	A	x			
LC-26d	SS	Q	A	A	x			
LC-35d	SS	Q	Q	Q	x	x	x	x
LC-40d	SS	Q	A	A	x			
LC-41d	SS	Q	A					
LC-47d	SS	Q	Q	Q	x	x	x	x
LC-50d	SS	Q	Q	Q	x	x	x	x
LC-66d	SS	Q	A	A	x			
LC-67d	SS	Q	A	A	x			
LC-69d	SS			Q	x	x	x	x
LC-70d	SS		Q	Q	x	x	x	x
LC-71d	LSS	Q	A	A	x			
LC-72d	SS	Q	A	A	x			
LC-73d	SS	Q	A	A	x			
LC-74d	LSS	Q	A	A	x			
LC-75d	SS	Q	Q	Q	x	x	x	x
LC-76d	SS	Q	Q	Q	x	x	x	x
LC-77d	SS	Q	Q	Q	x	x	x	x
LC-126	SS	Q	A	A	x			
LC-166d	SS	Q						
PS 13	SS		Q	Q	x	x	x	x
MAMC3	SS		Q	Q	x	x	x	x
MAMC4	LSS		Q	Q	x	x	x	x
Total Quarterly wells:		18	10	11				
Total Semi-annual wells:		0	0	0				
Total Annual wells:		0	11	10				
Total # wells:		18	21	21	21	11	11	11
Total # samples:		72	51	54	21	11	11	11

Notes:

(1) Current sample frequency as of 24th Quarter (Sep 01)

(2) Proposed Remedial Action Monitoring sample frequency based on Draft LOGRAM NOR (May 01)

(3) Revised sample frequency based on USEPA & USGS comments received on Draft LOGRAM NOR

Table does not include Lower Aquifer multi-port wells not yet installed

SS=(Upper) Salmon Springs, LSS=Lower Salmon Springs;

Q=Quarterly, S=Semi-annually, A=Annually

NA=Not Applicable; bladder pump not needed for sampling

**Table 15 (Continued)**  
**Sampling Schedule Summary - Surface Water**  
**LOGRAM Network Optimization, Ft. Lewis, WA**

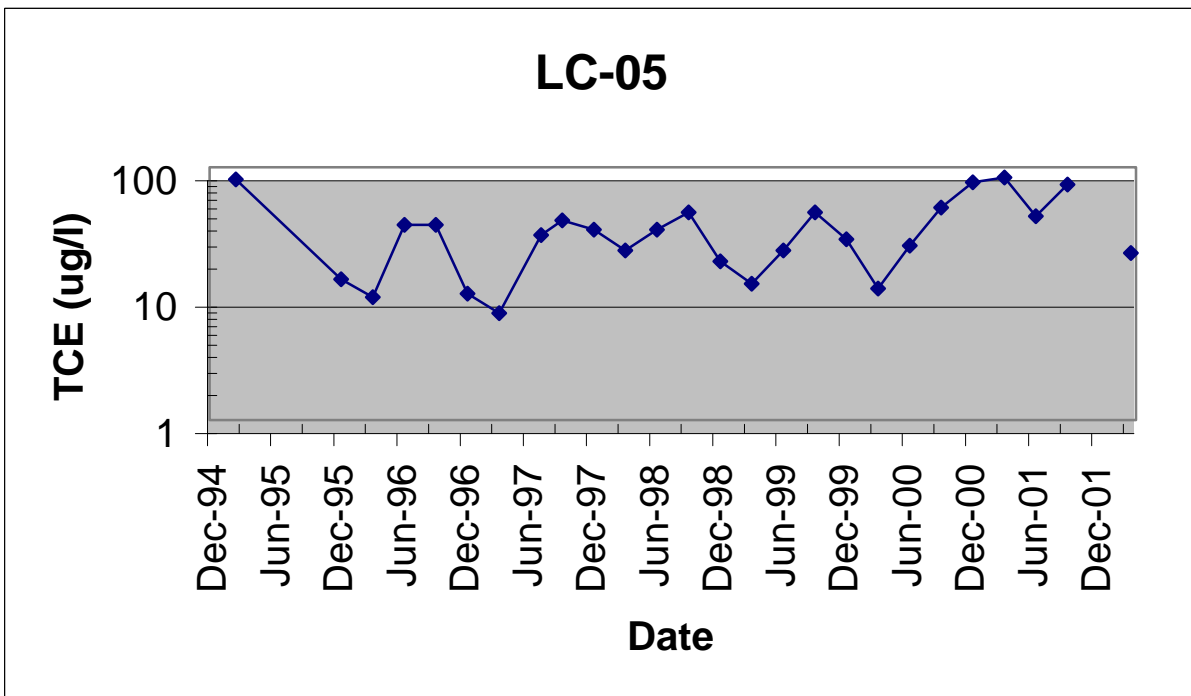
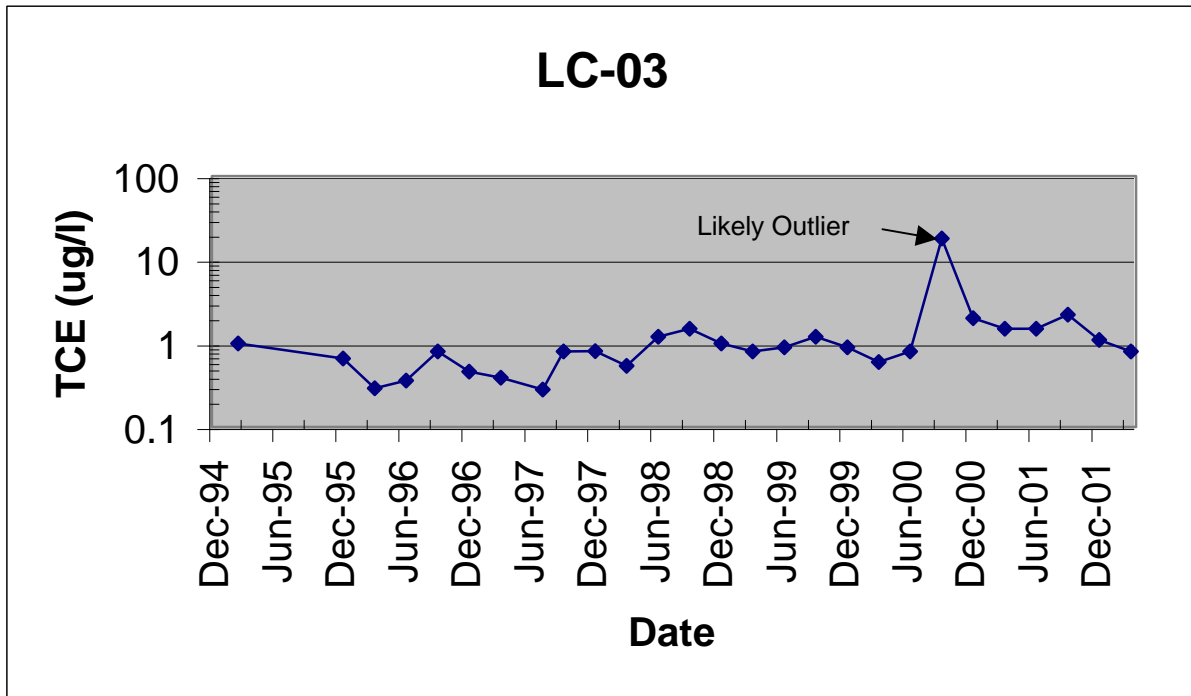
Sample Location ID	Hydro-logic Unit	CURRENT (1) Sample Frequency	PROP RAM (2) Sample Frequency	REVISED (3) Sample Frequency	REVISED (3) Sample Schedule			
					Mar	Jun	Sep	Dec
SW-MC-1	Murray Crk	Q	A	A	x			
SW-MC-4	Murray Crk	Q	Q	Q	x	x	x	x
SW-MC-6 (4)	Murray Crk			Q	x	x	x	x
Total Quarterly locations:		2	1	2				
Total Semi-annual locations:		0	0	0				
Total Annual locations:		0	1	1				
Total # locations:		2	2	3	3	2	2	2
Total # samples:		8	5	9	3	2	2	2

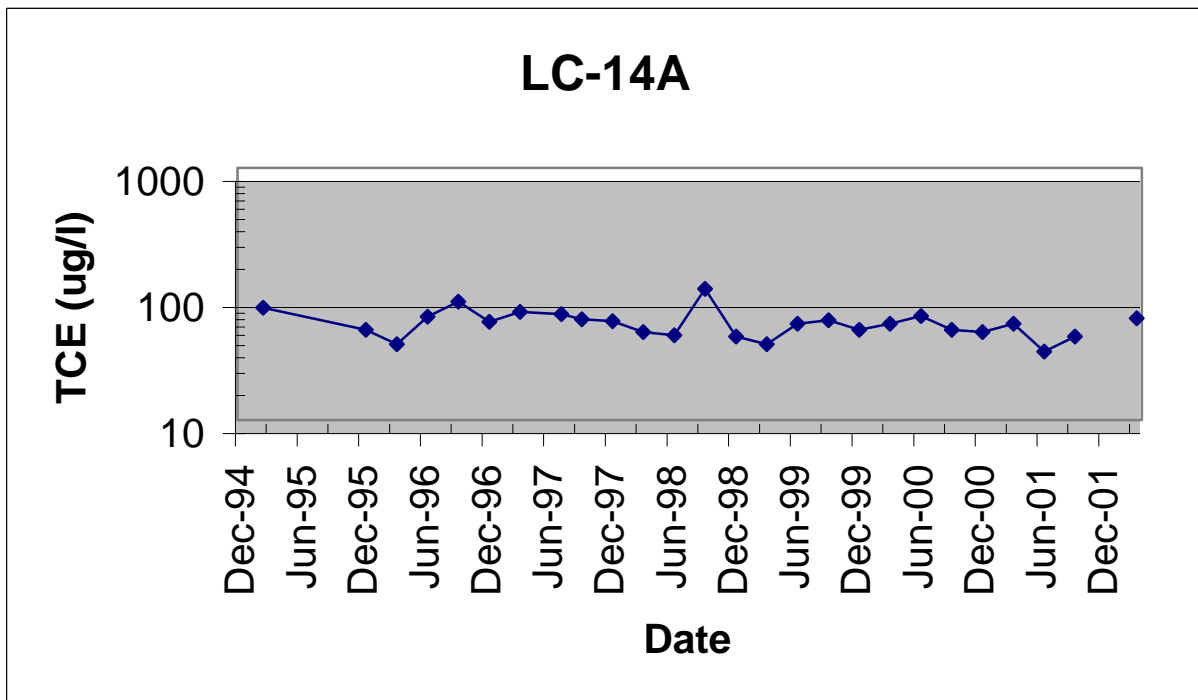
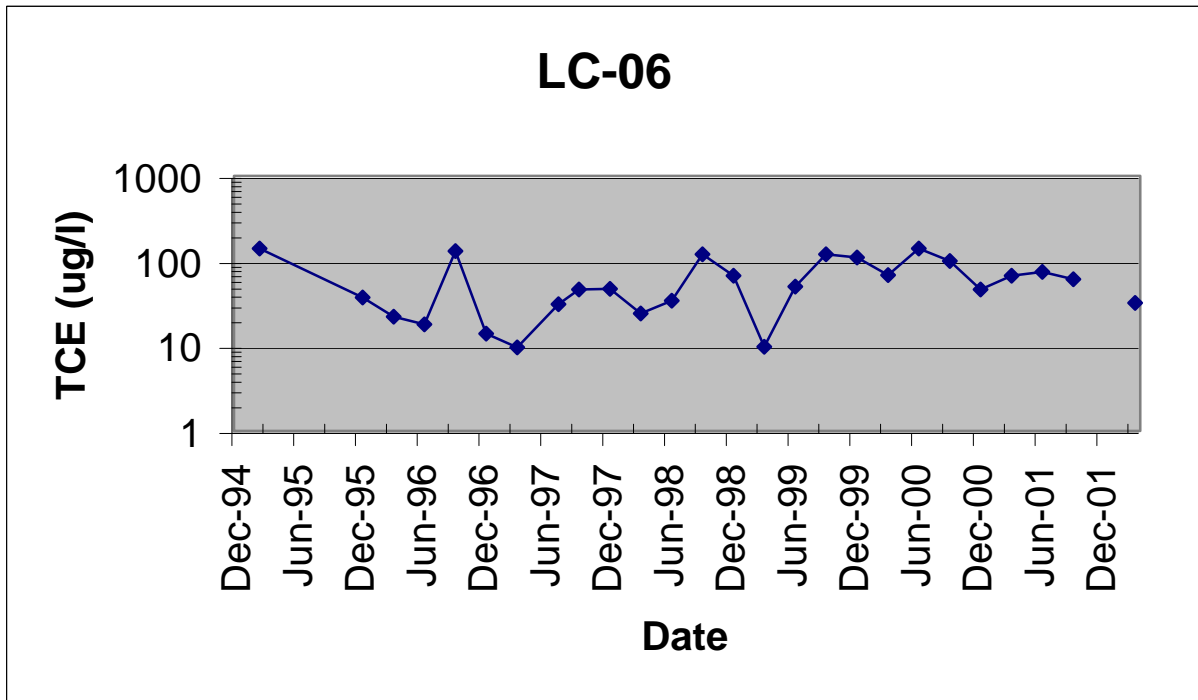
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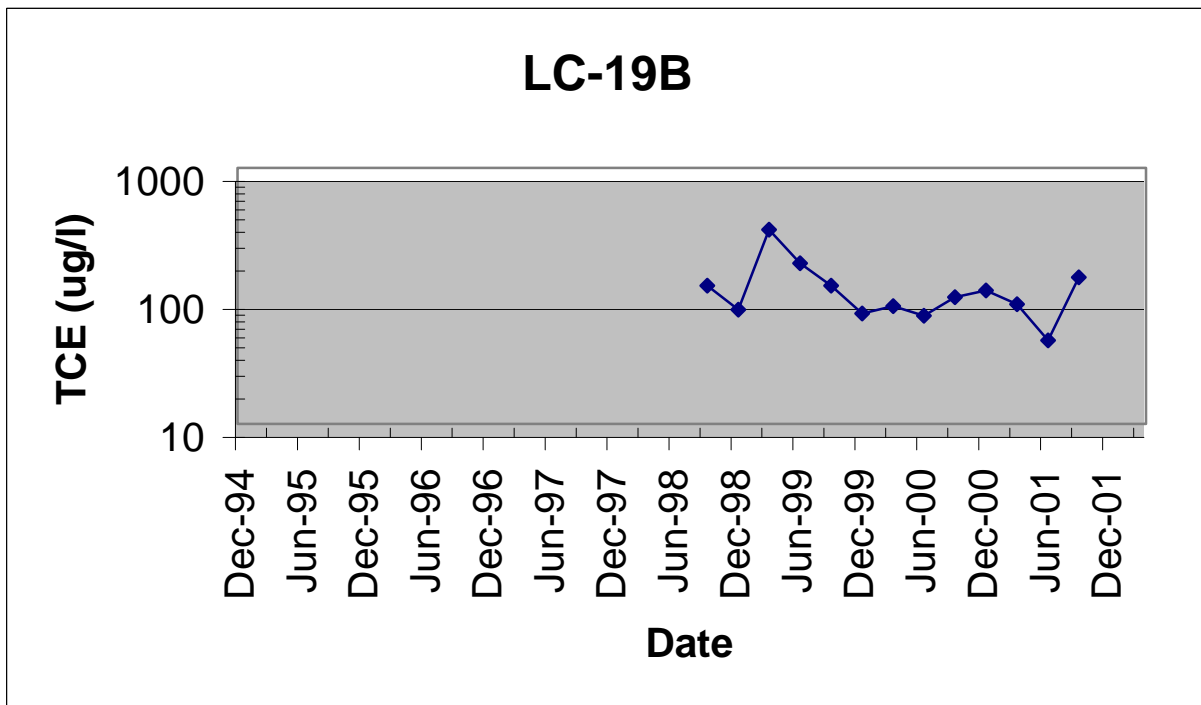
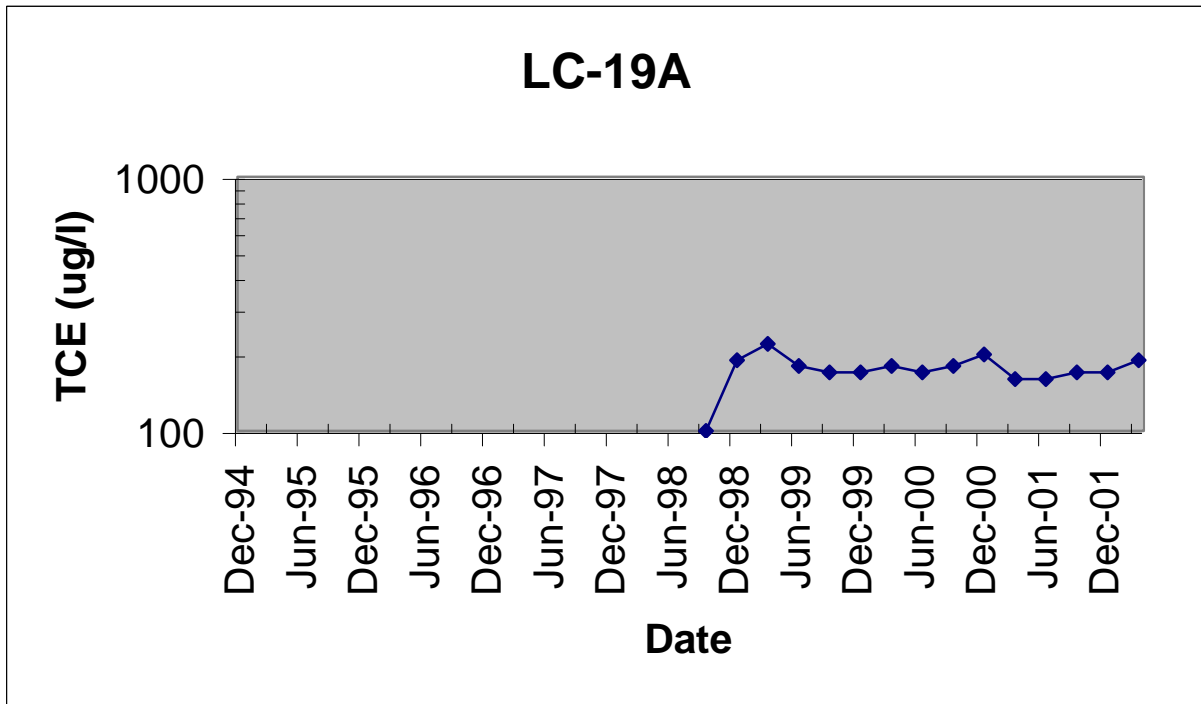
- (1) Current sample frequency as of 24th Quarter (Sep 01)
  - (2) Proposed Remedial Action Monitoring sample frequency based on Draft LOGRAM NOR (May 01)
  - (3) Revised sample frequency based on USEPA & USGS comments received on Draft LOGRAM NOR
  - (4) SW-MC-6 located SW of EGDY & SE of Madigan Housing, where TCE likely enters creek
- SW-MC-6 location is staked along Murray Crk footpath  
Q=Quarterly, S=Semi-annually, A=Annually

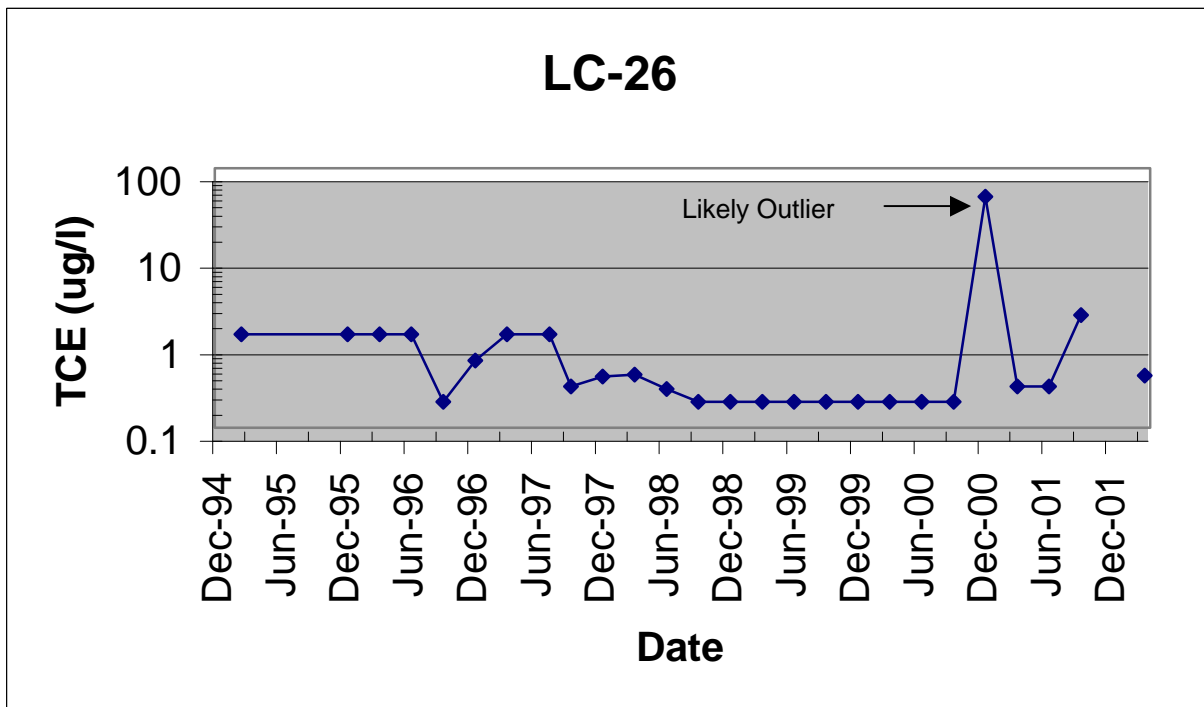
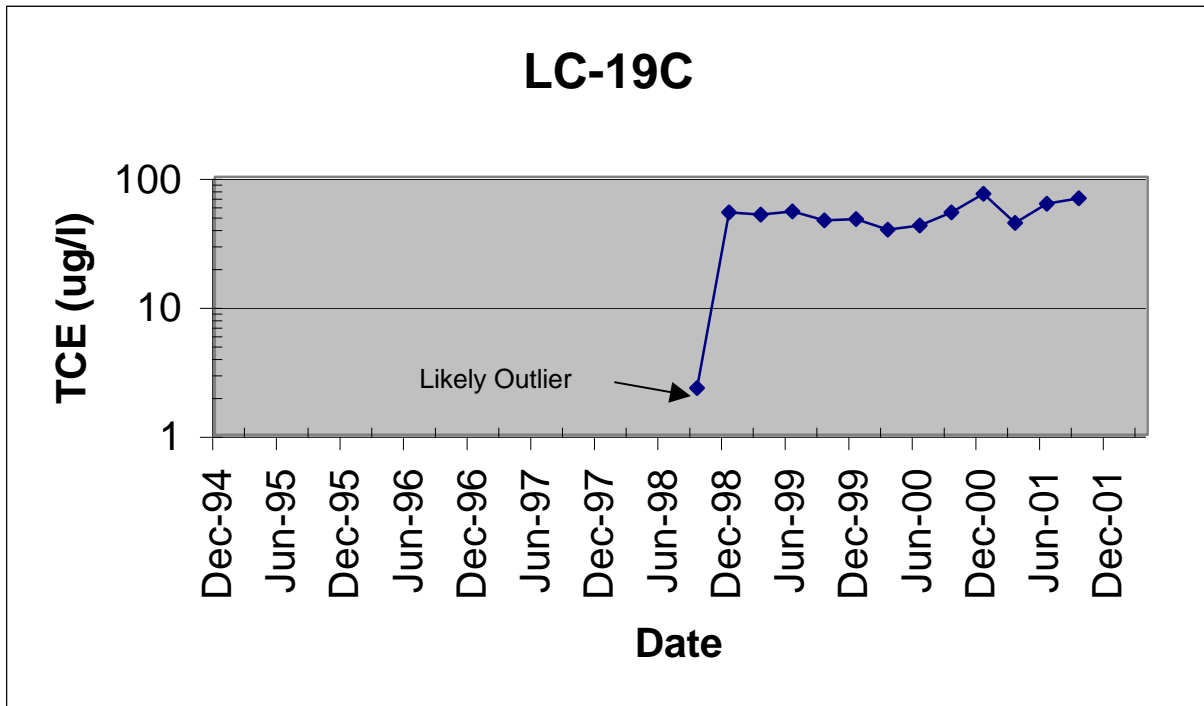
## **Appendix 1**

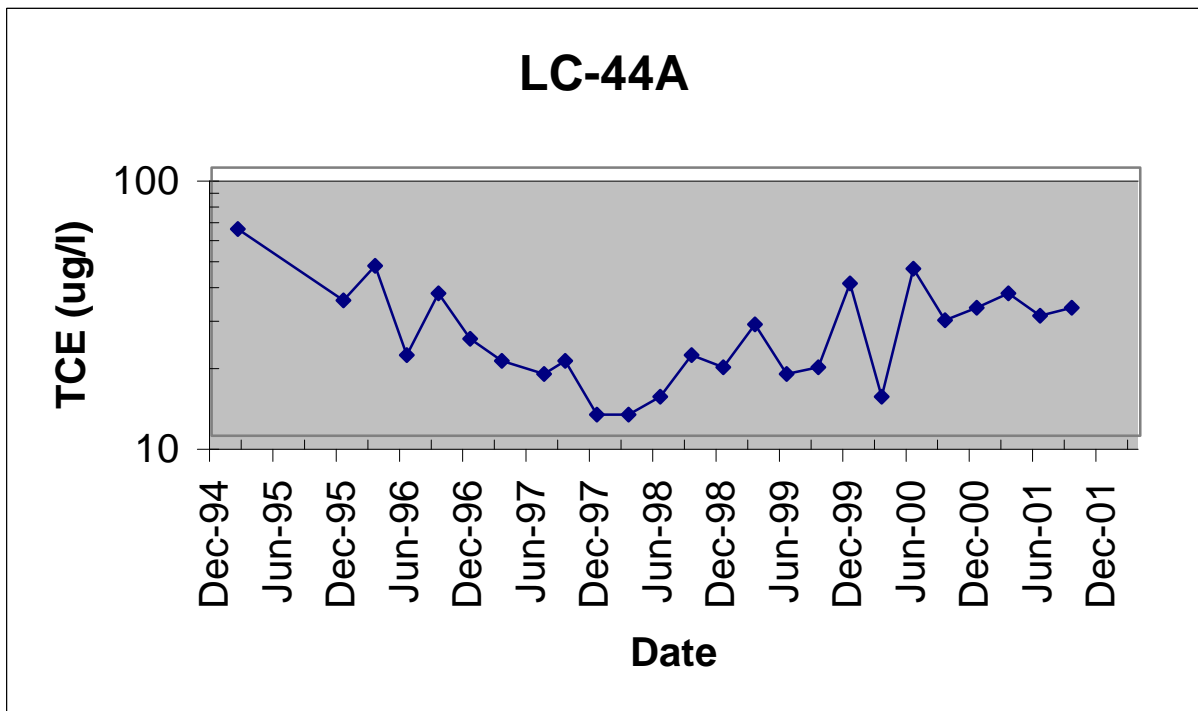
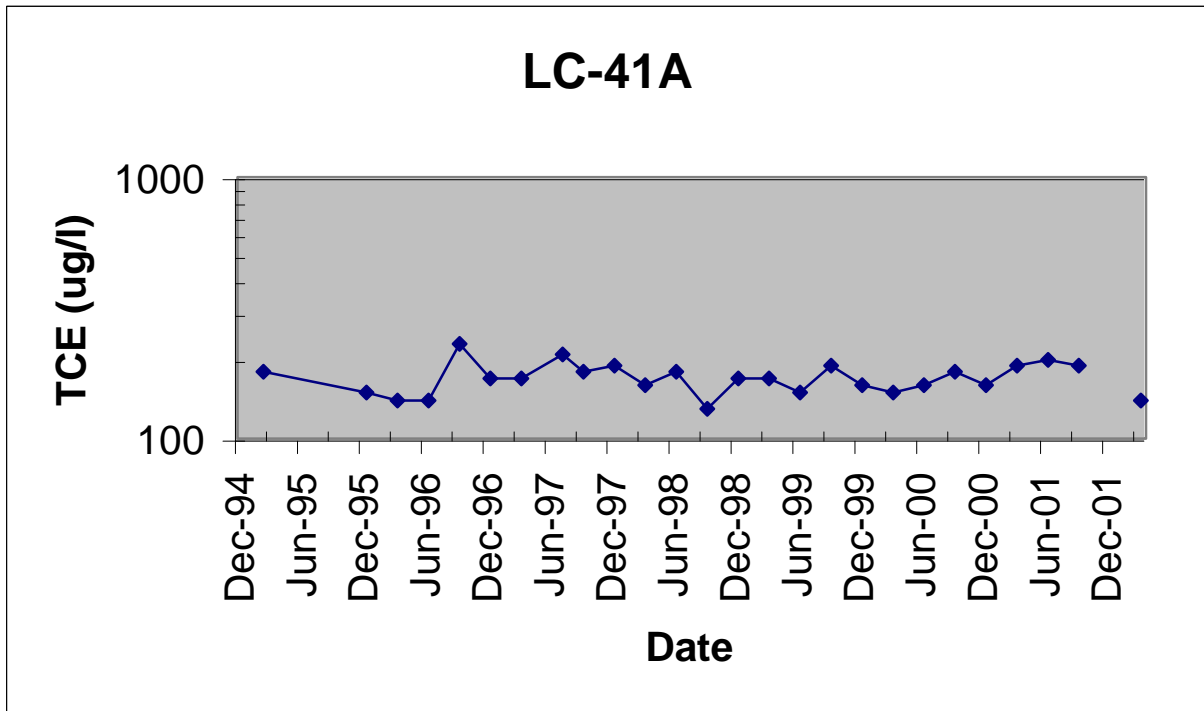
### **Graphical Summaries of TCE Concentrations Over Time**

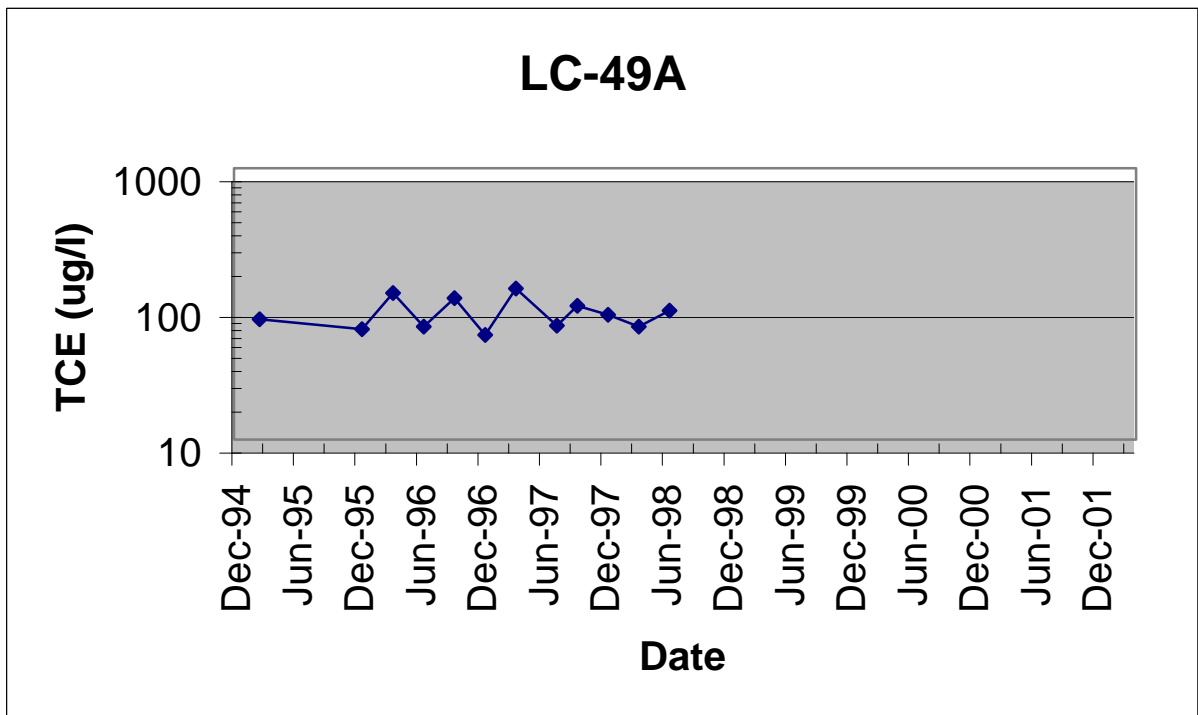
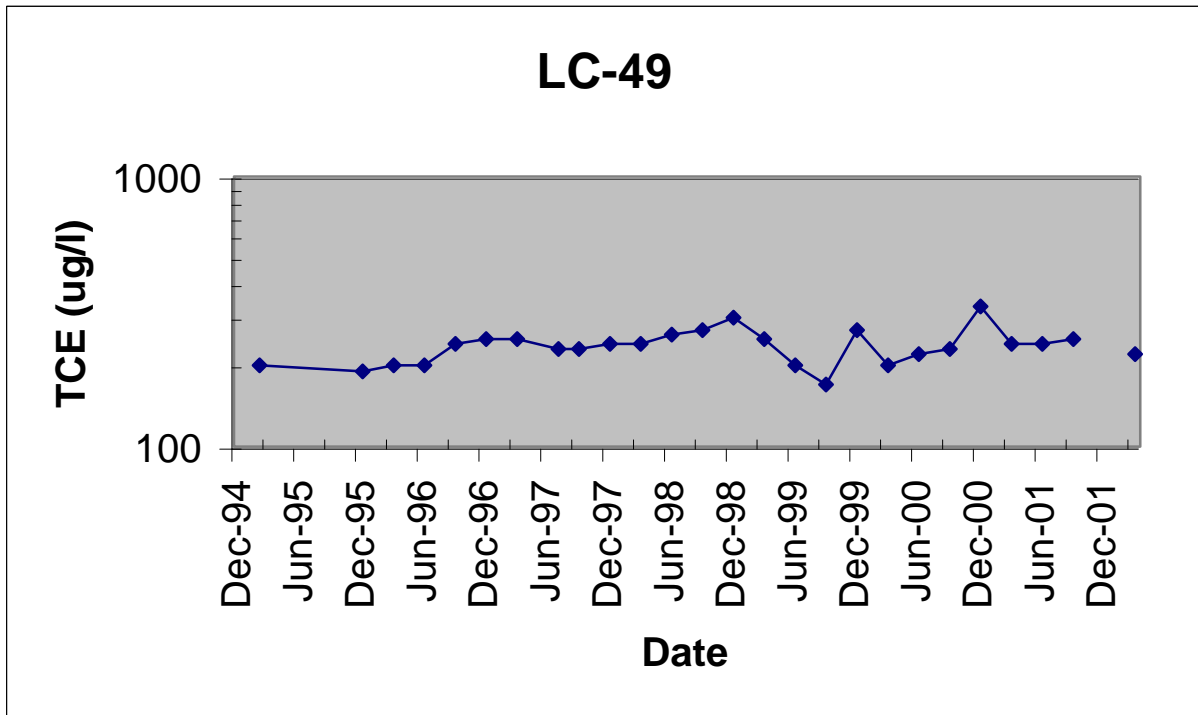


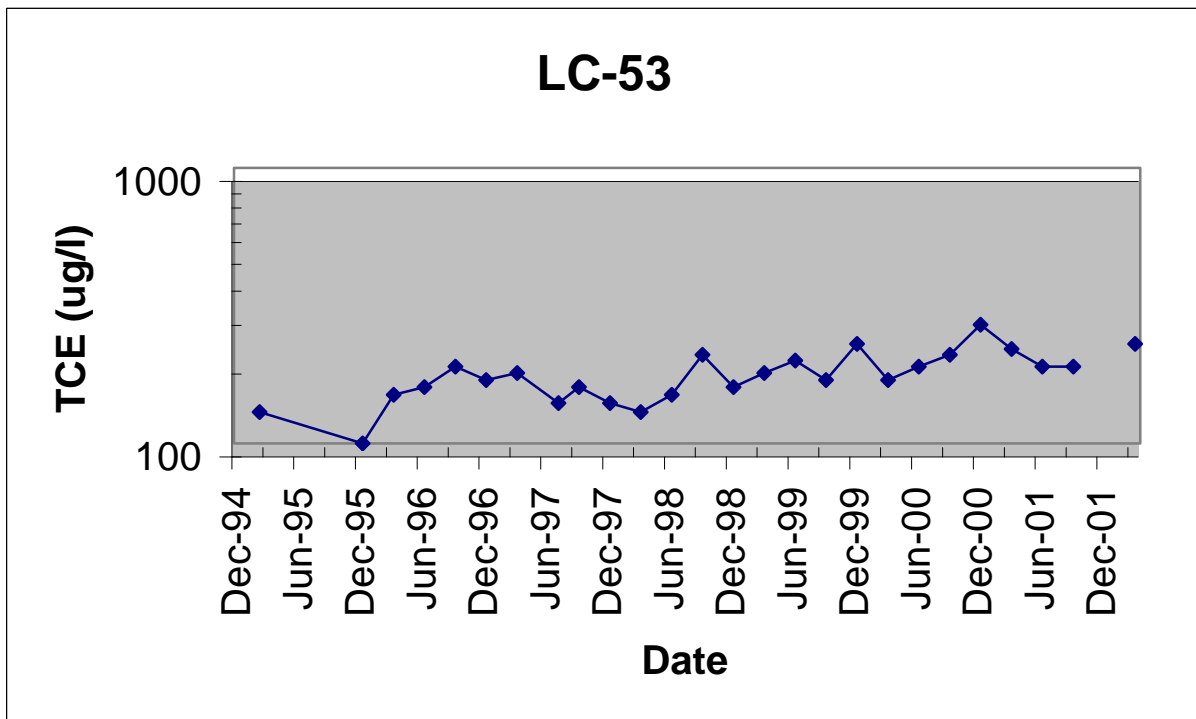
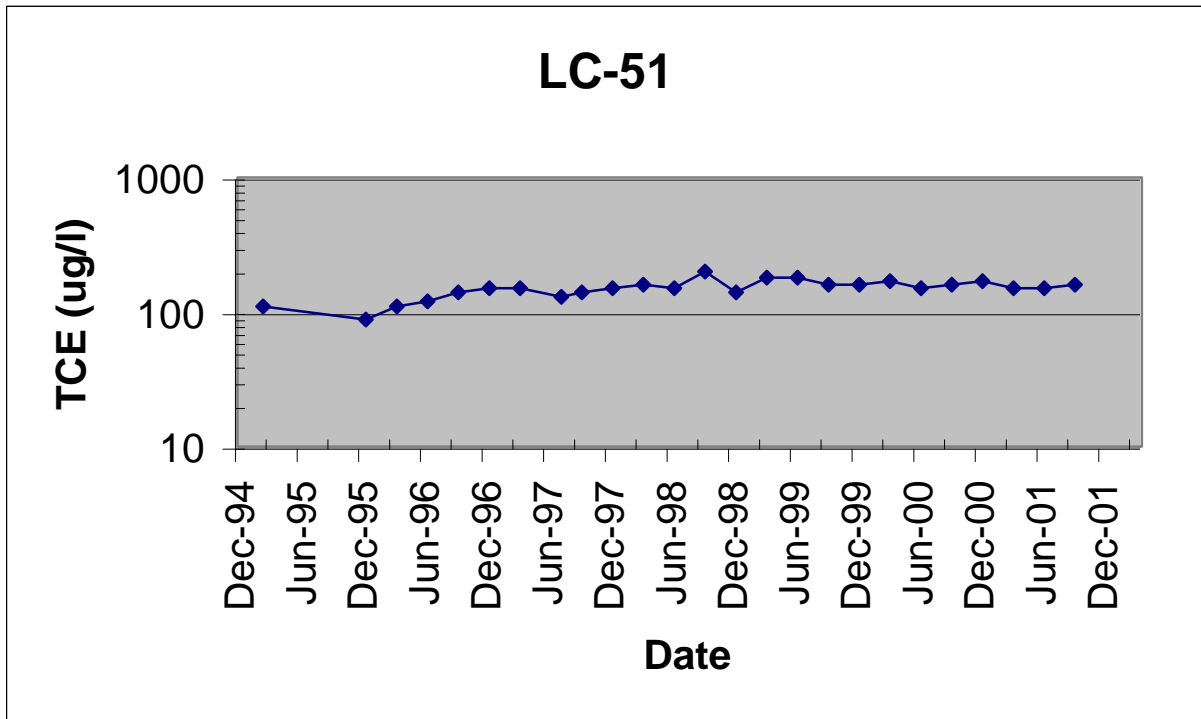


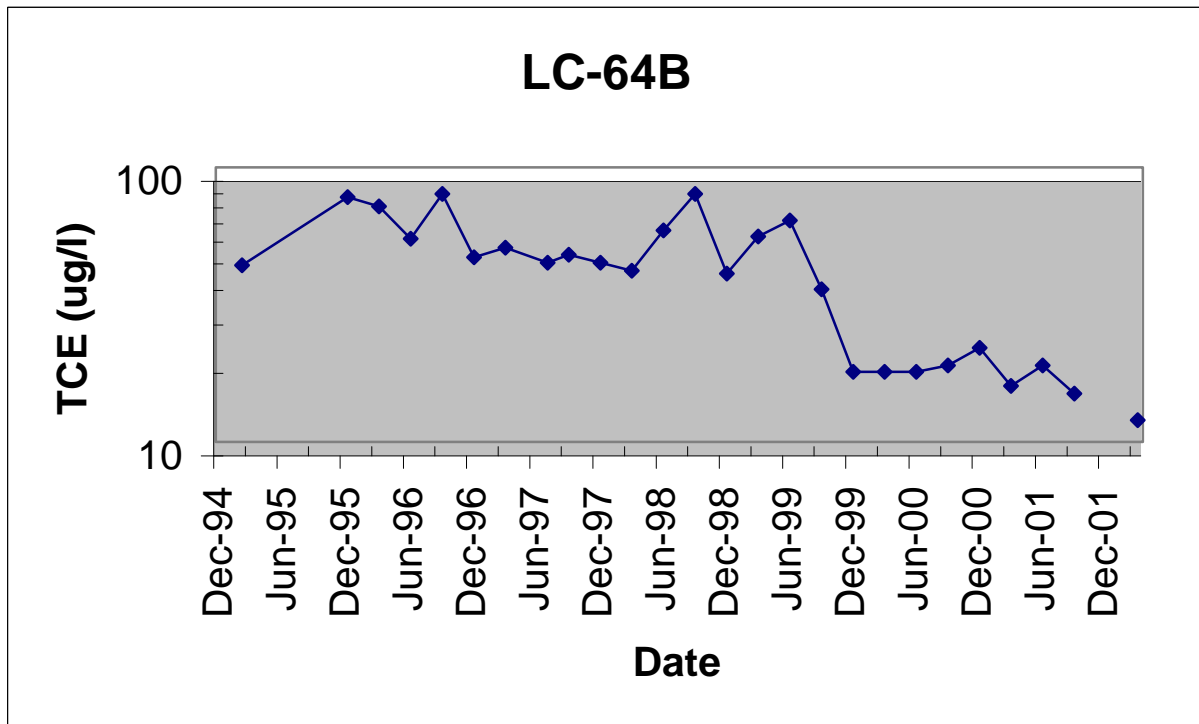
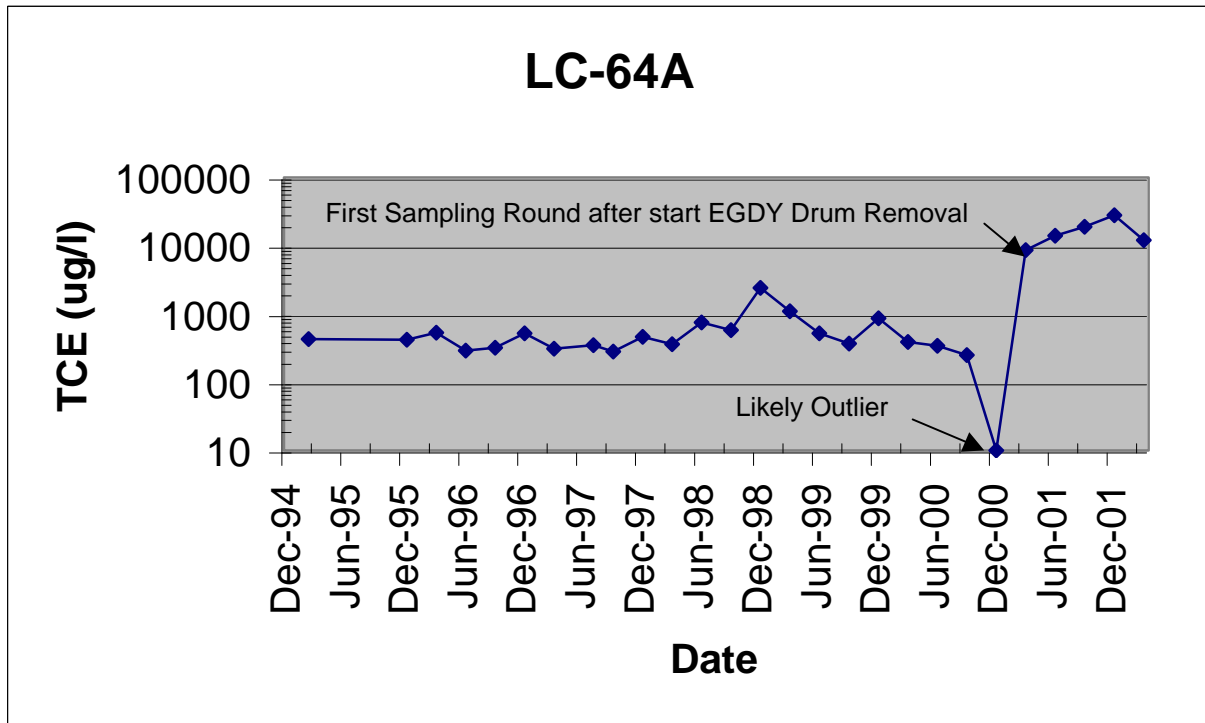


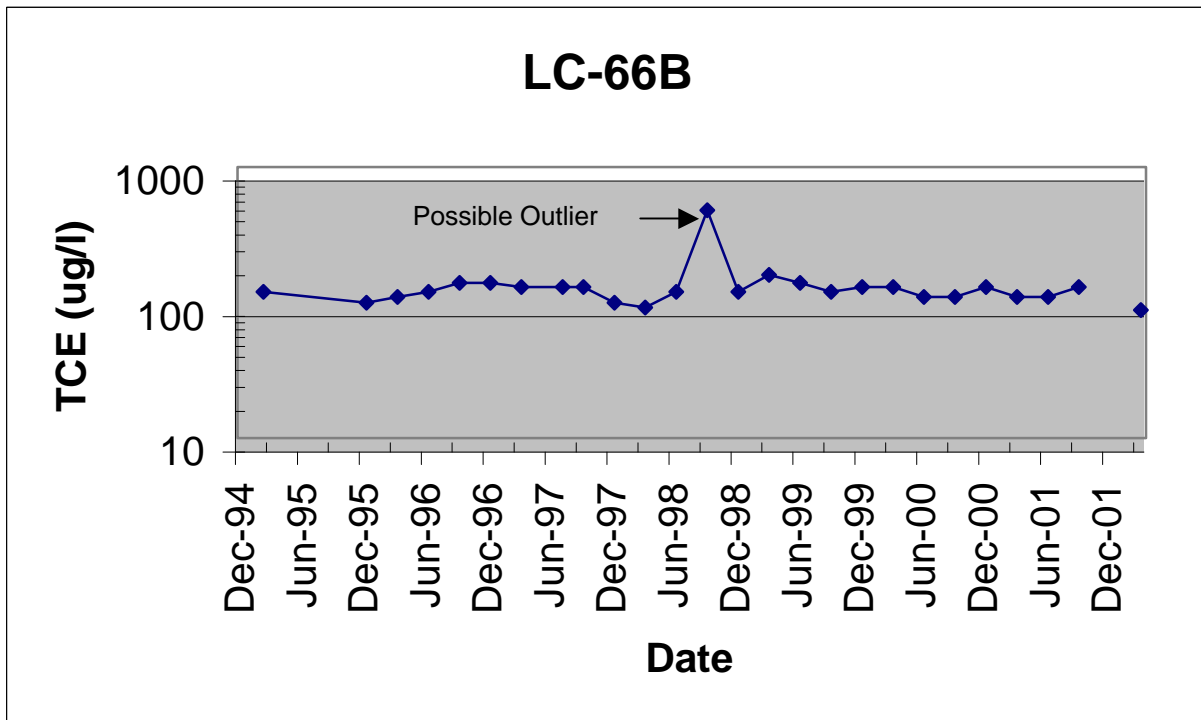
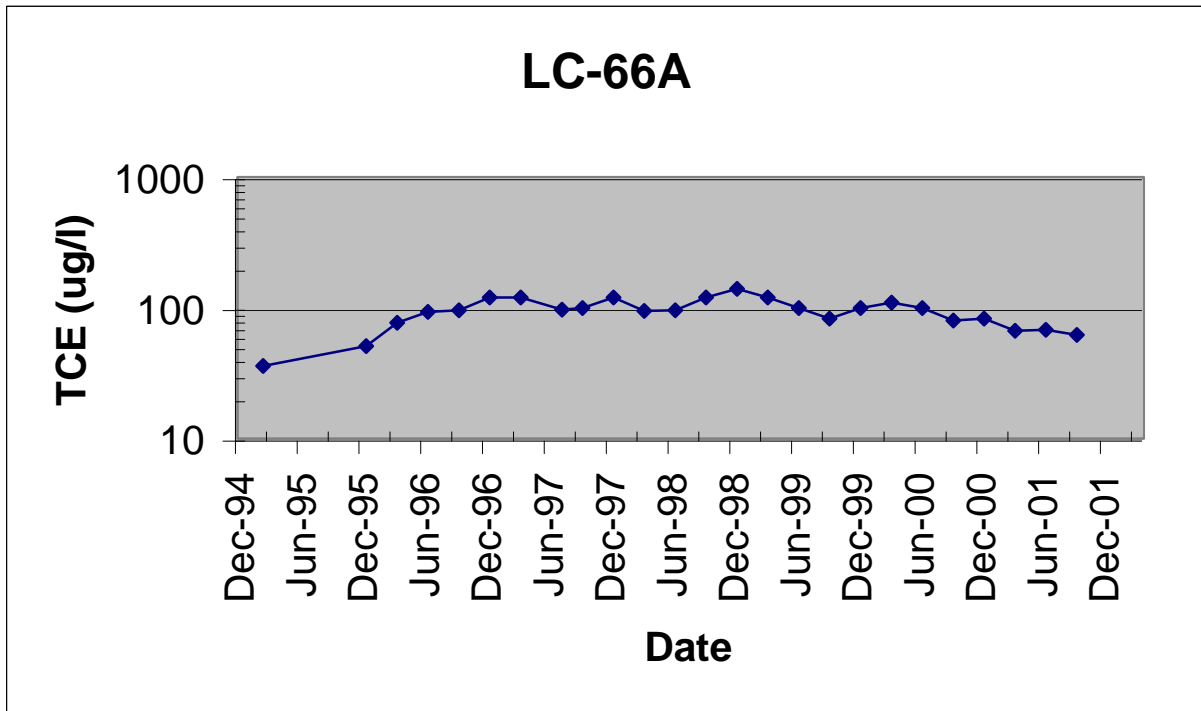


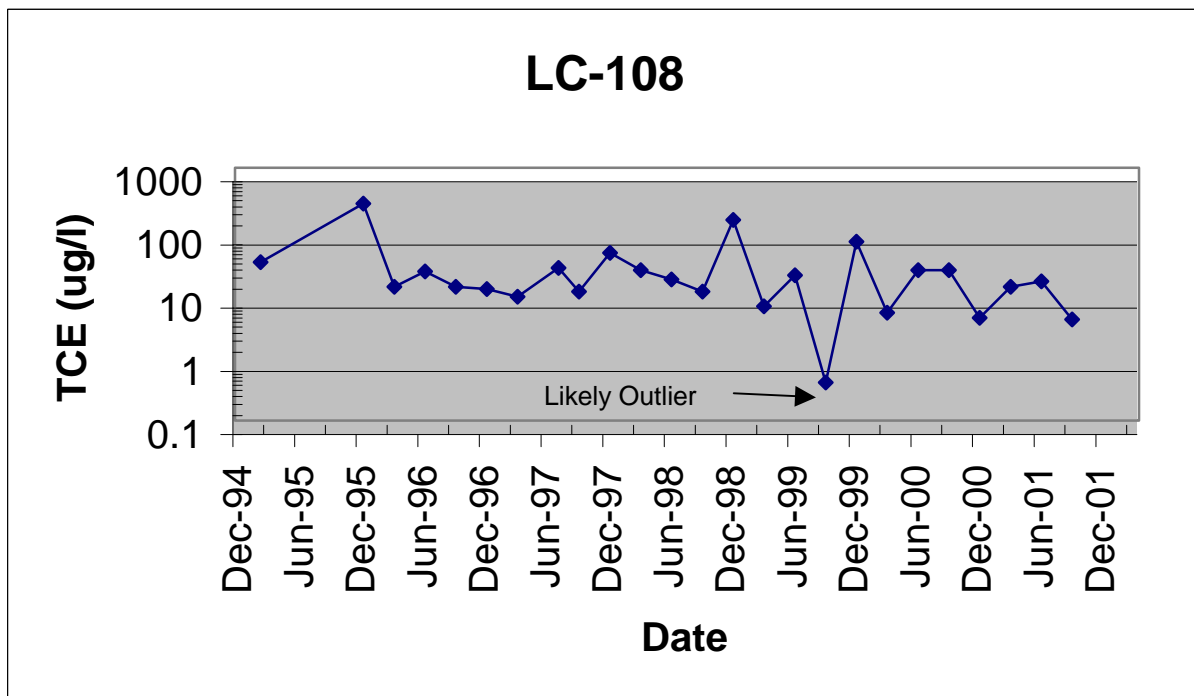
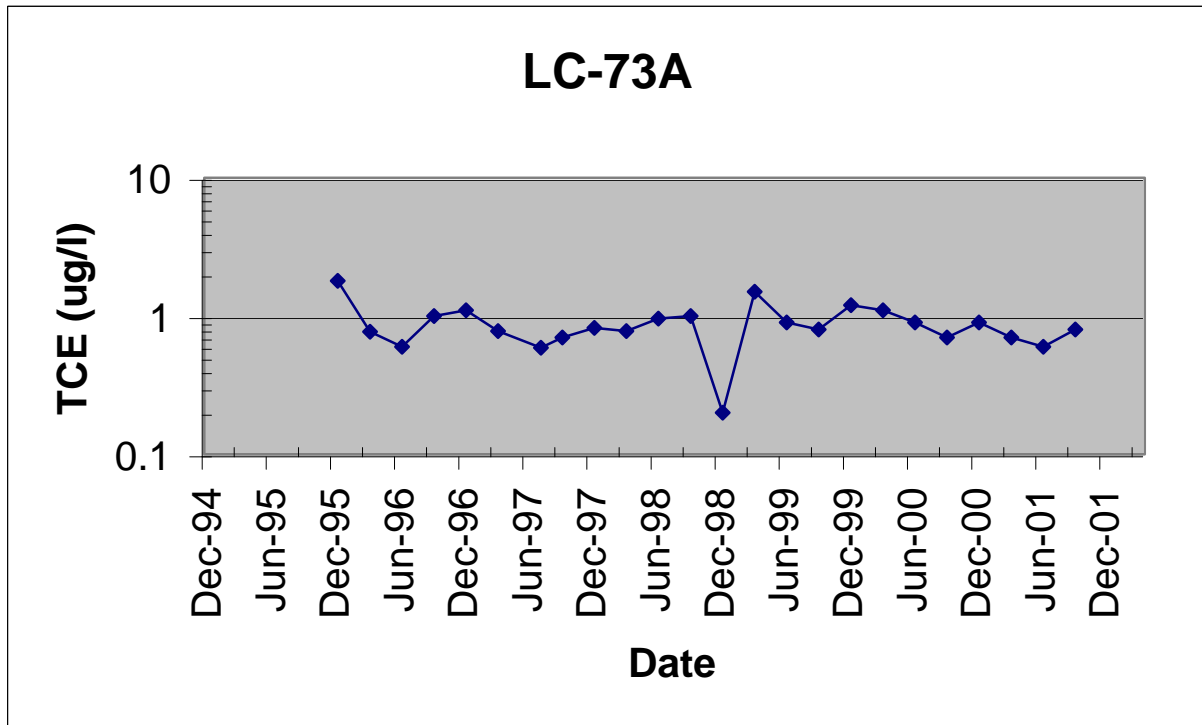


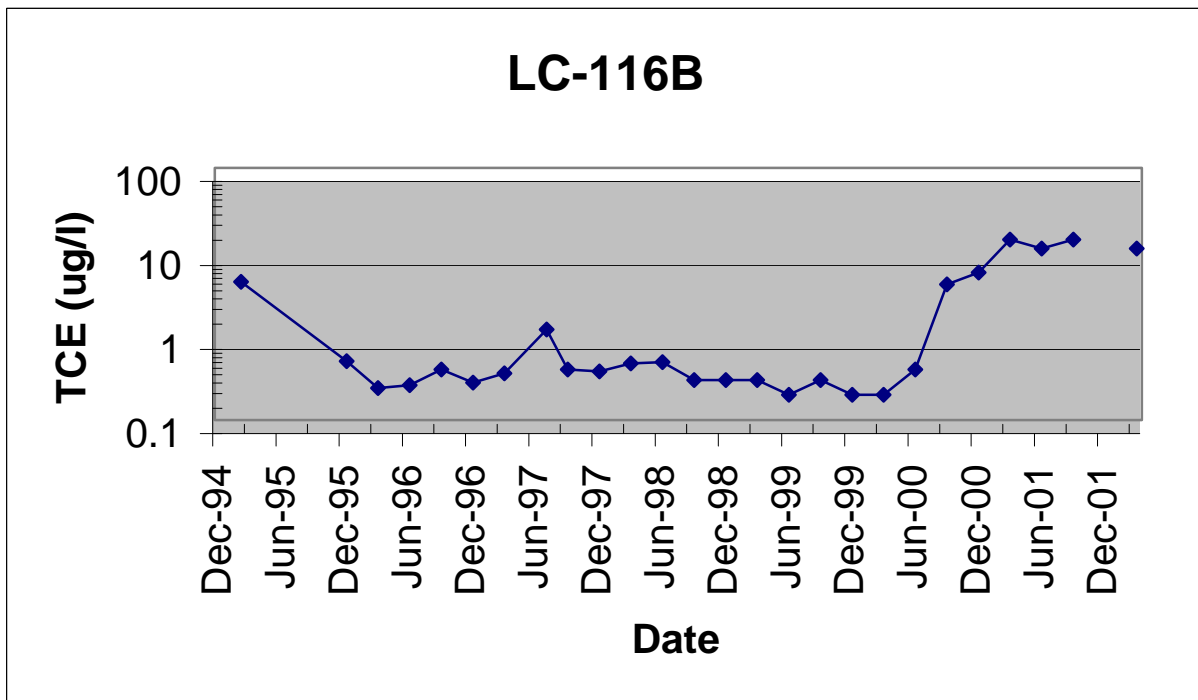
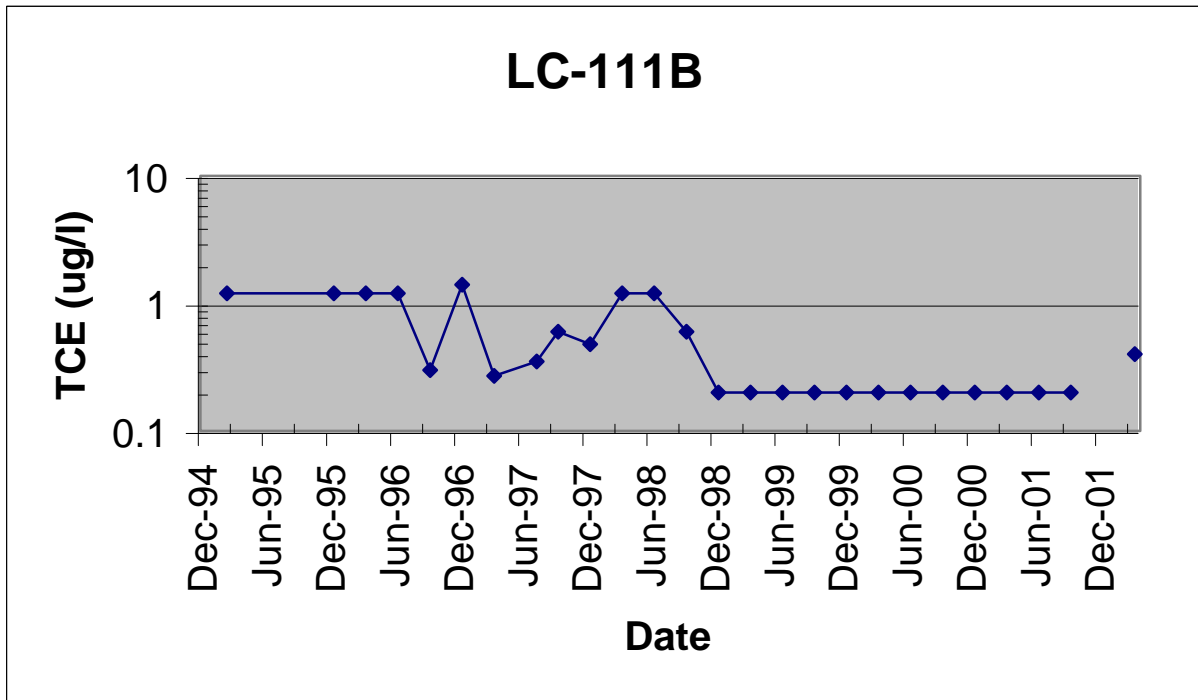


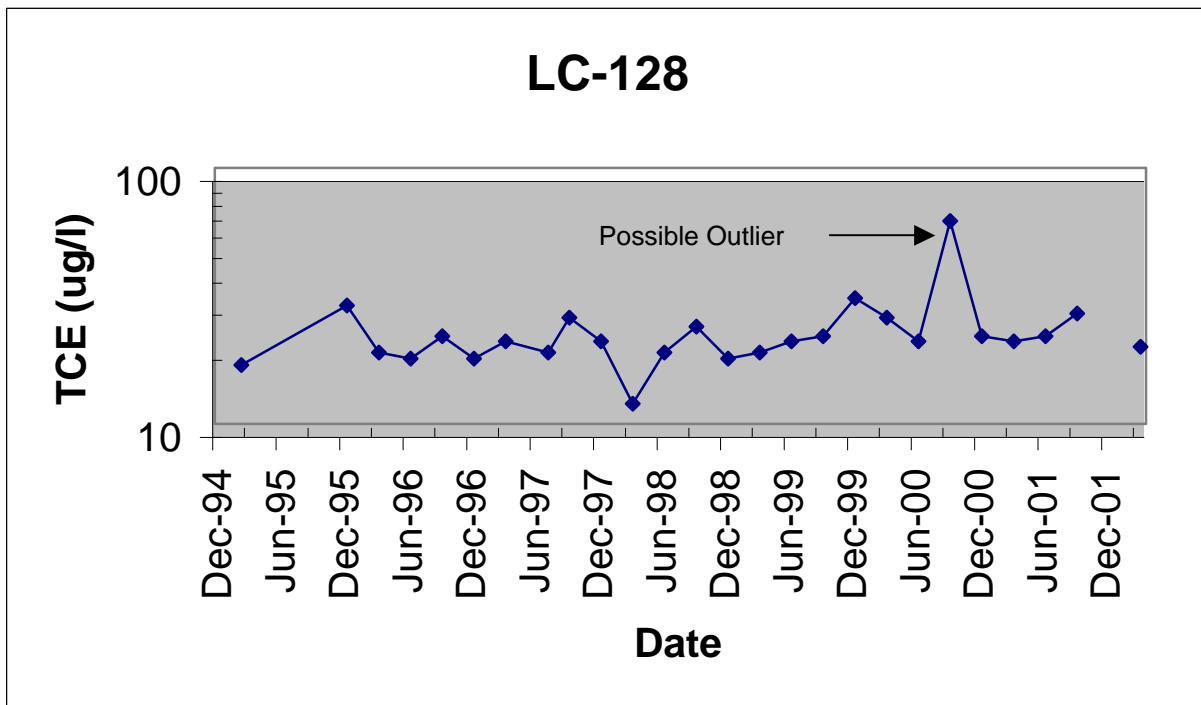
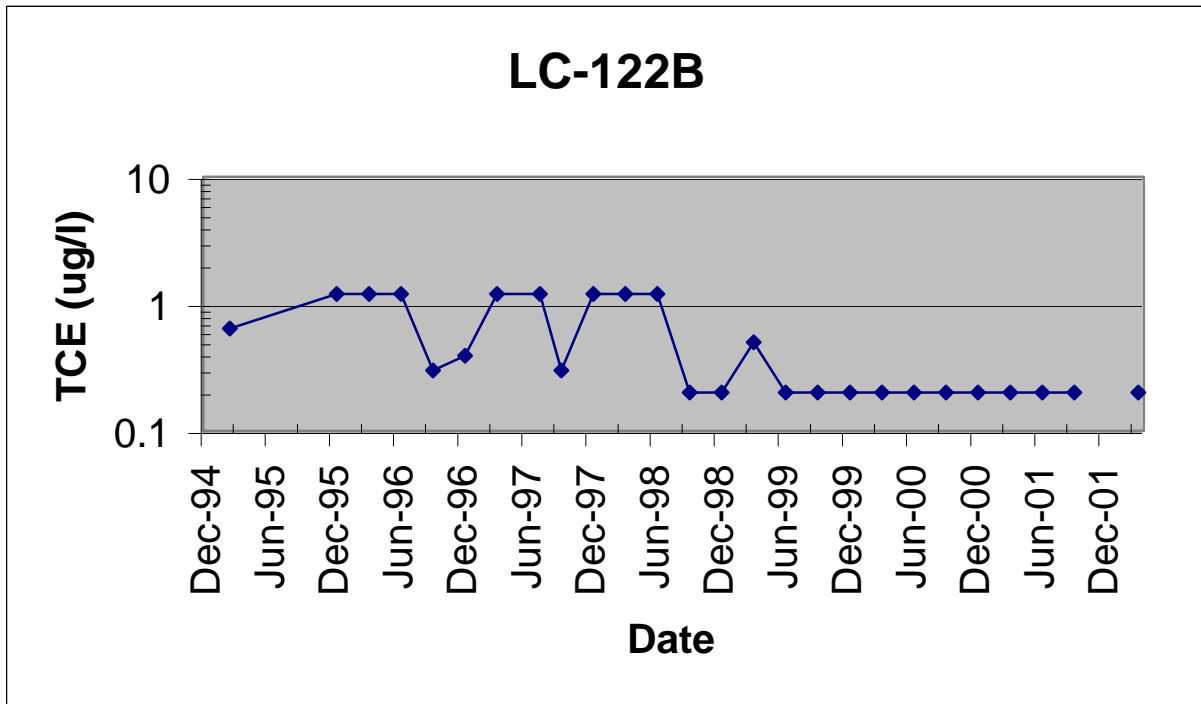


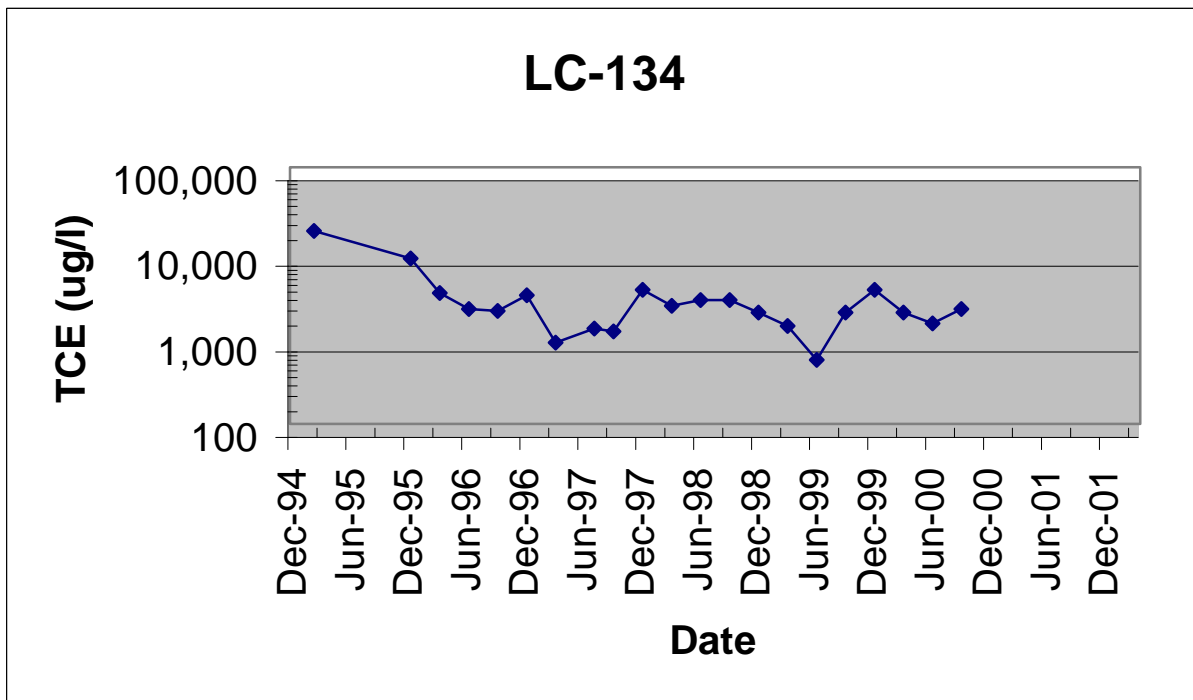
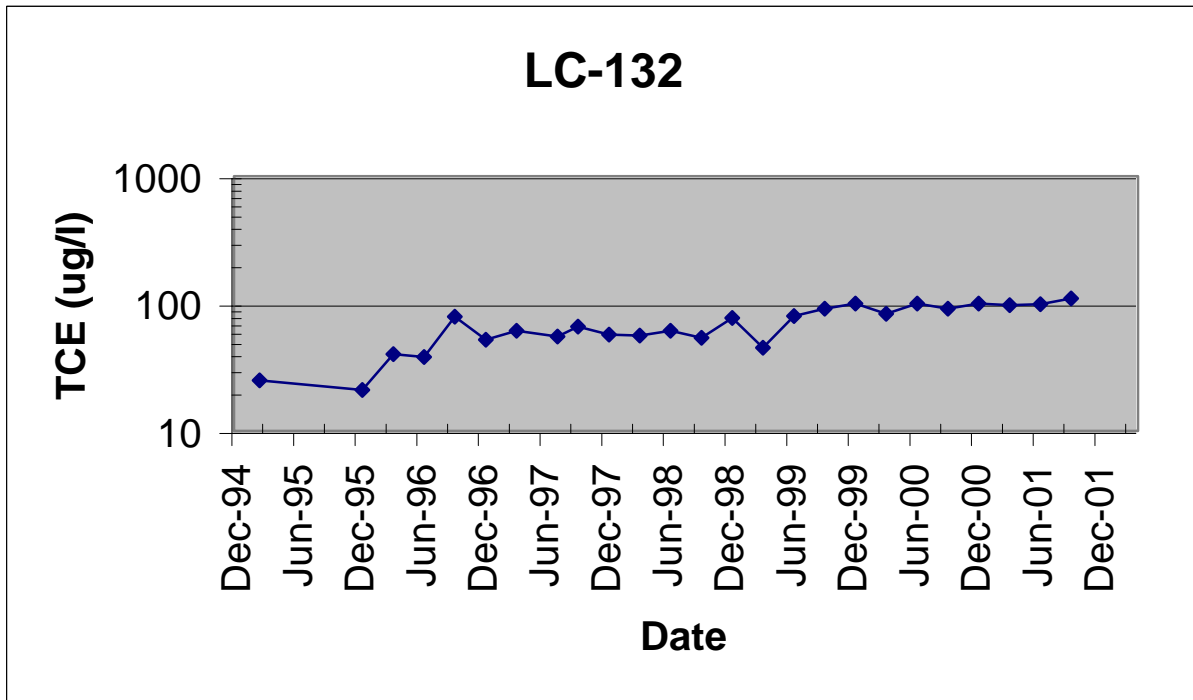


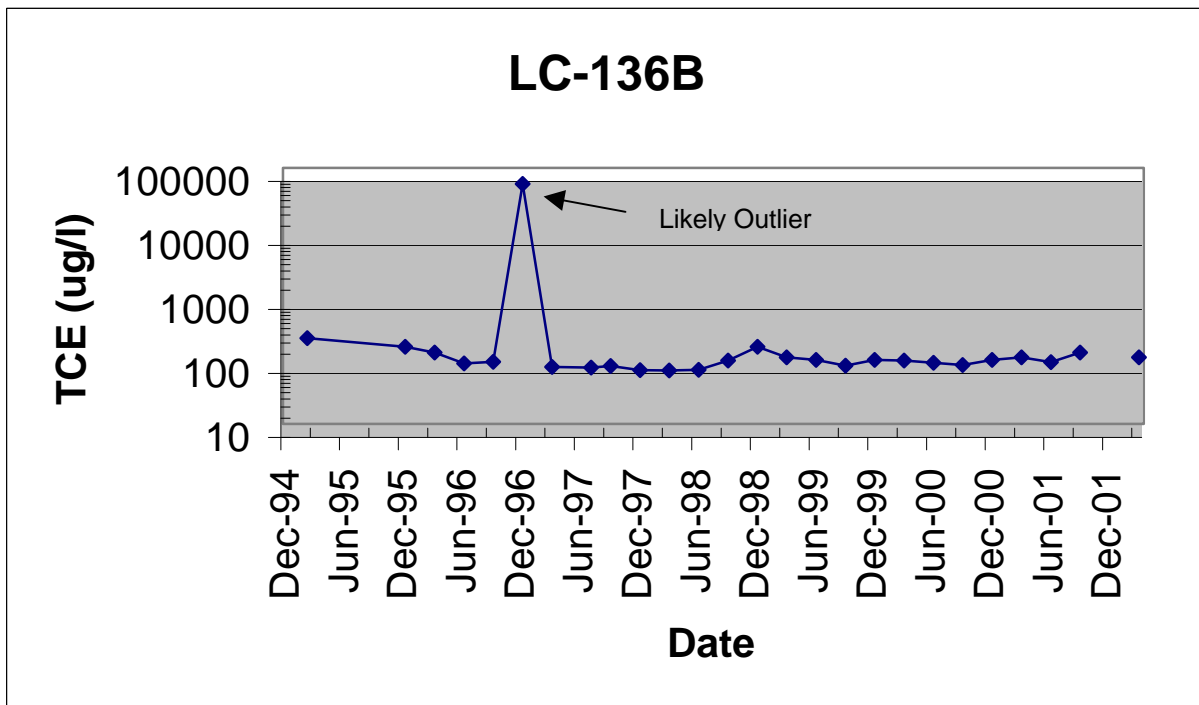
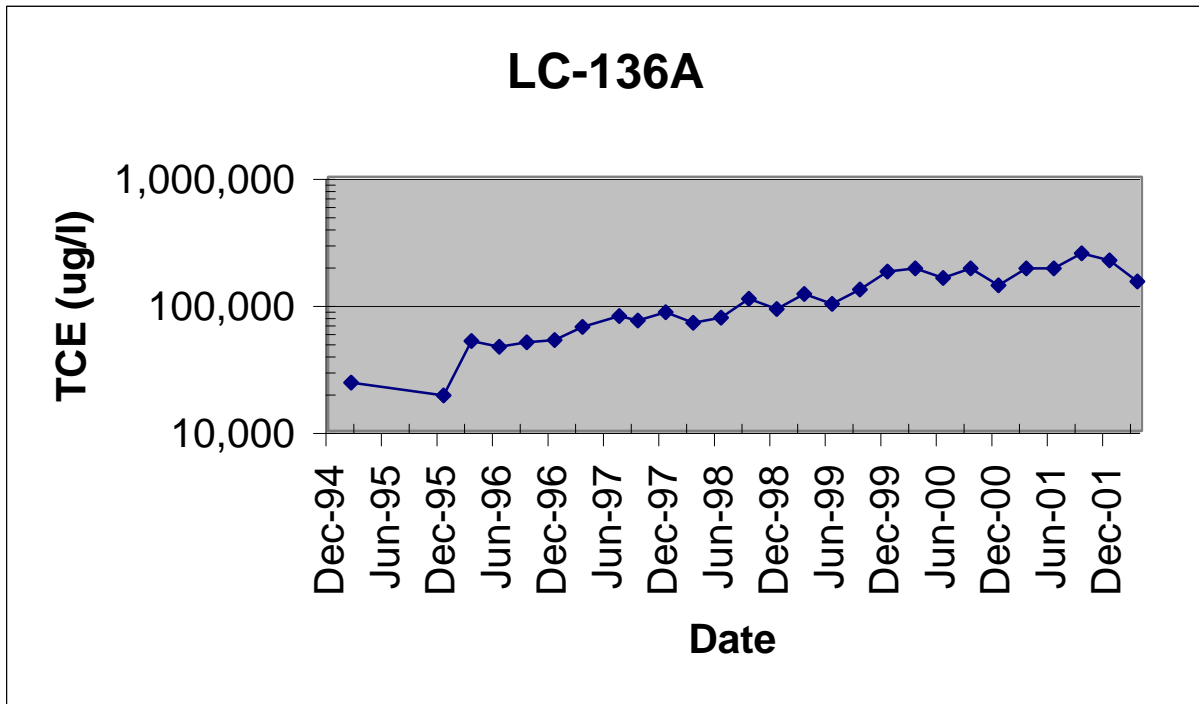


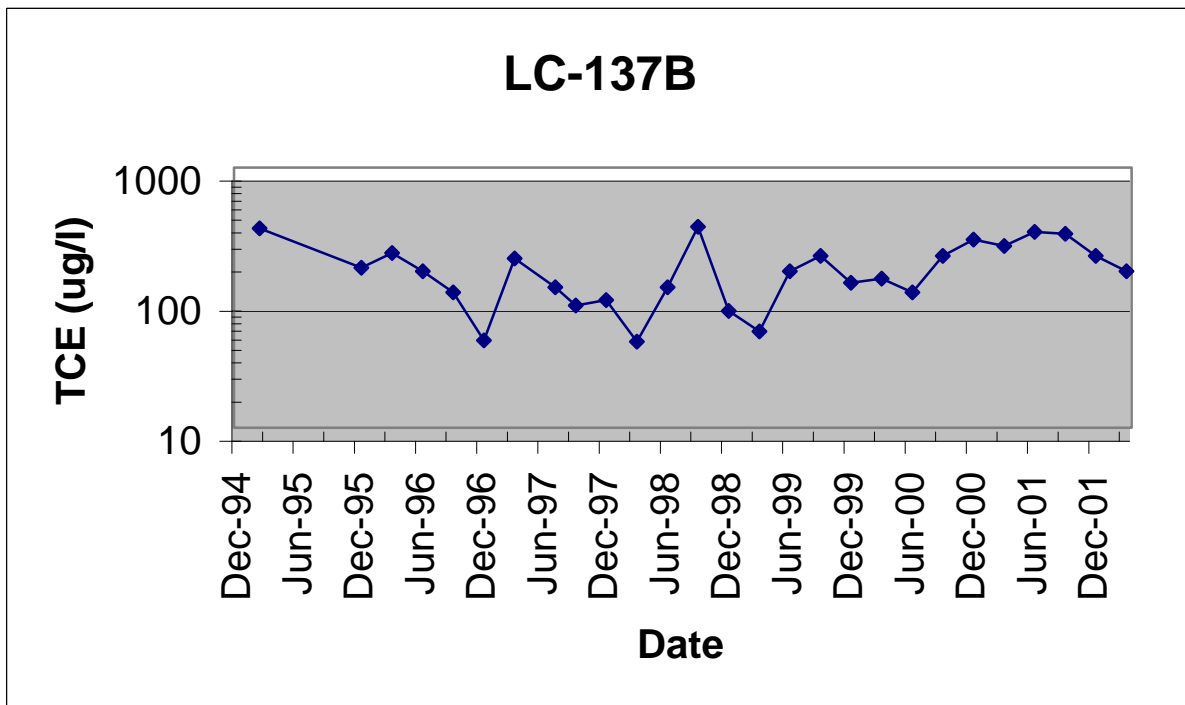
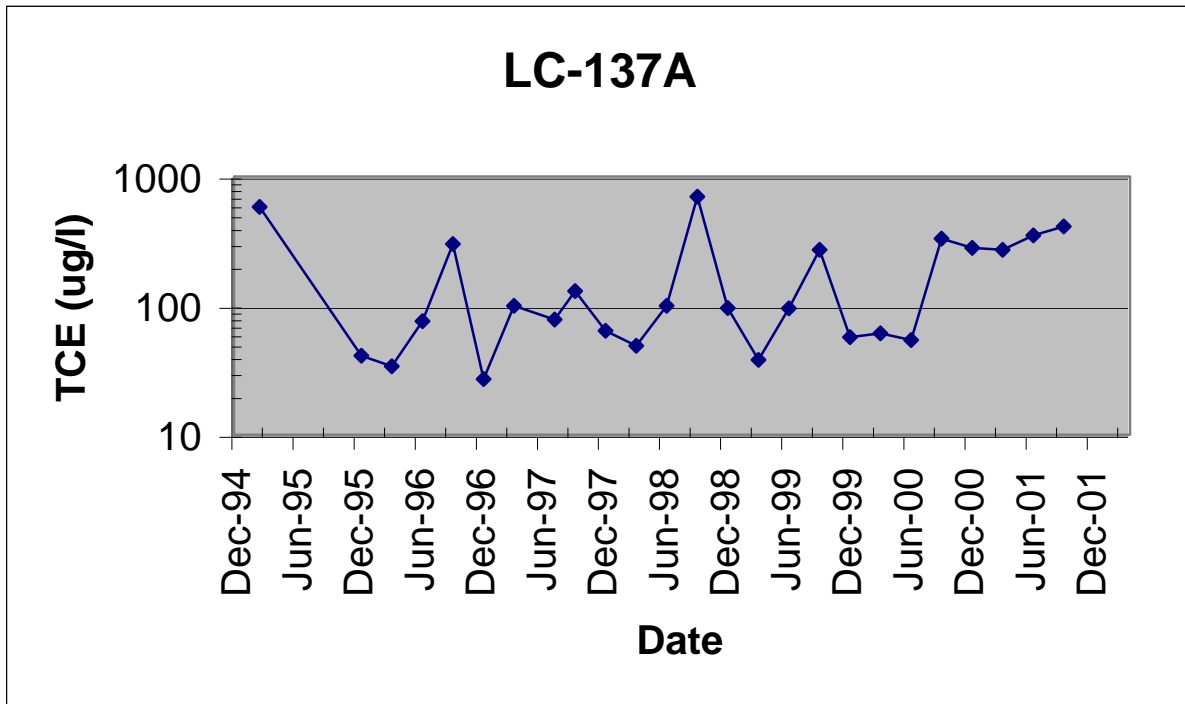


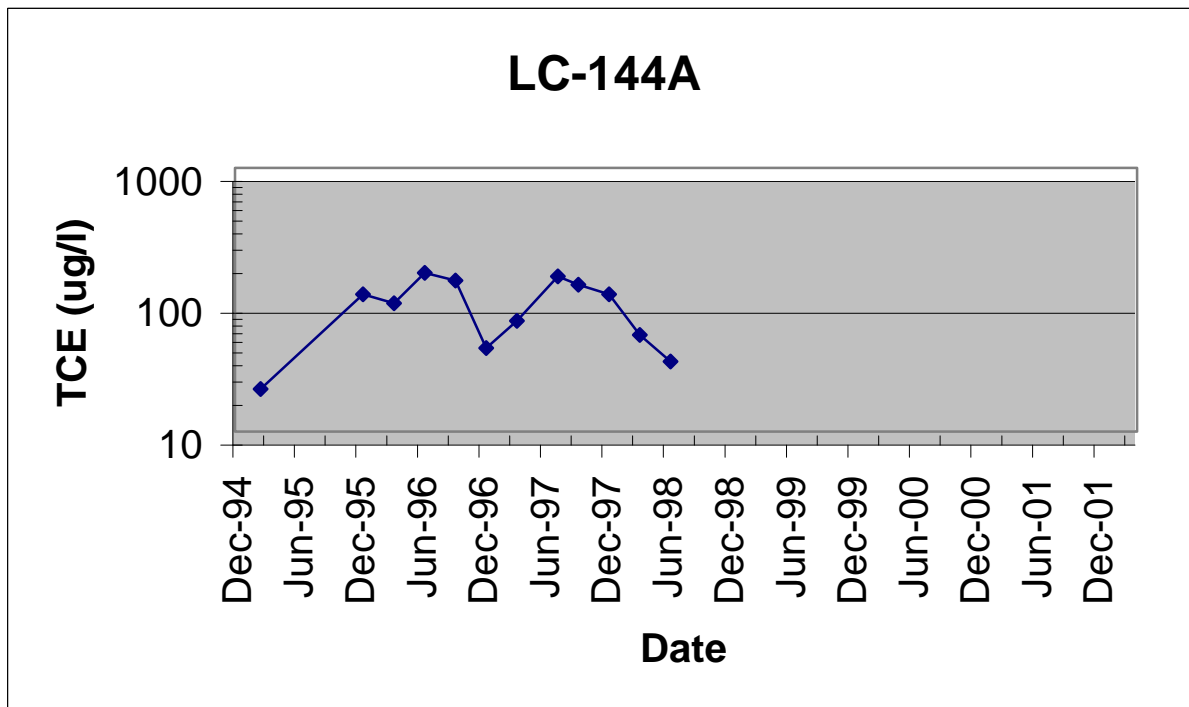
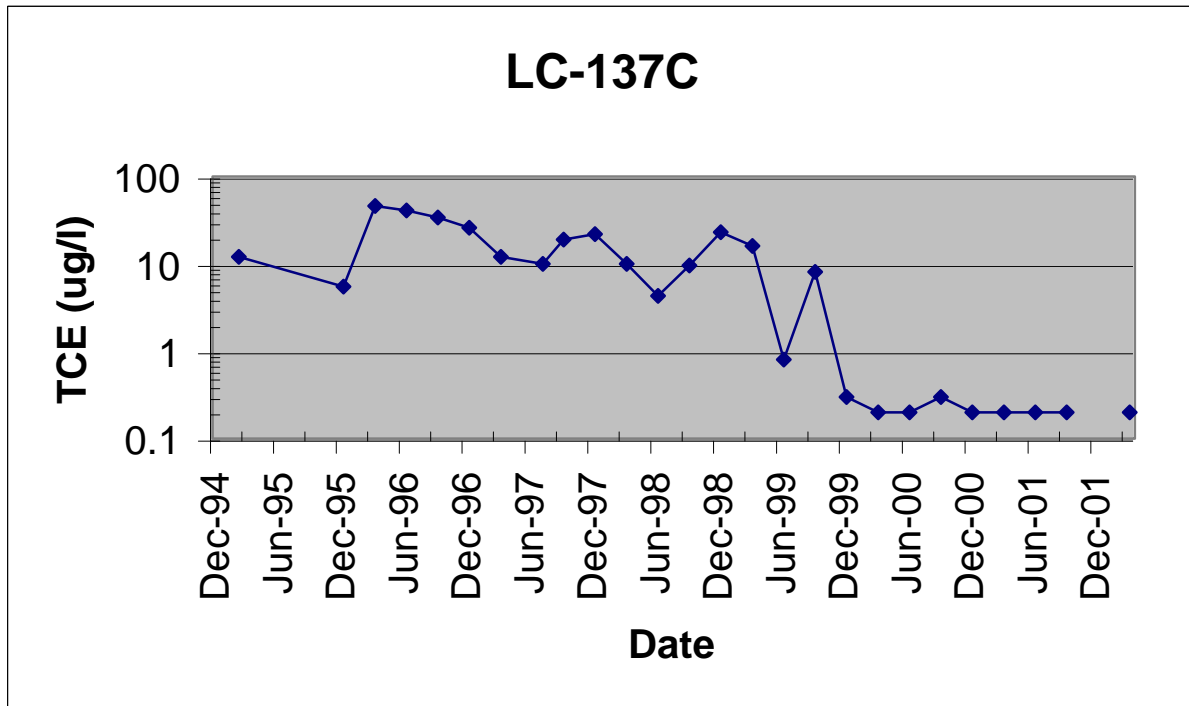


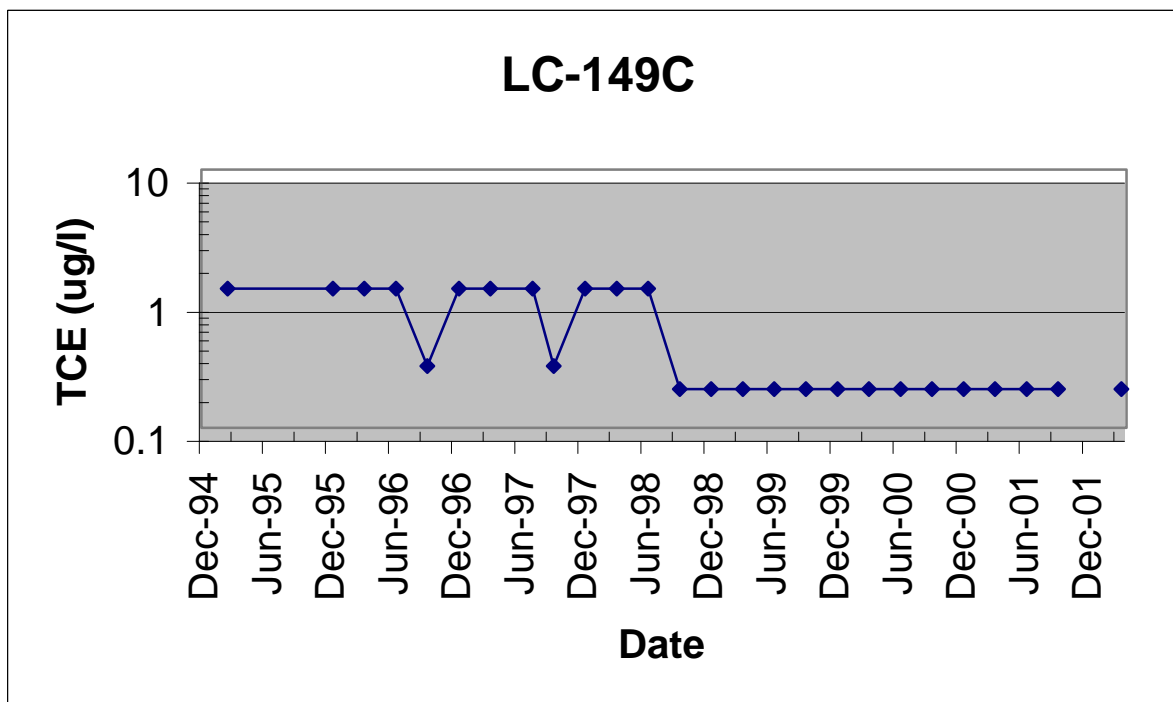
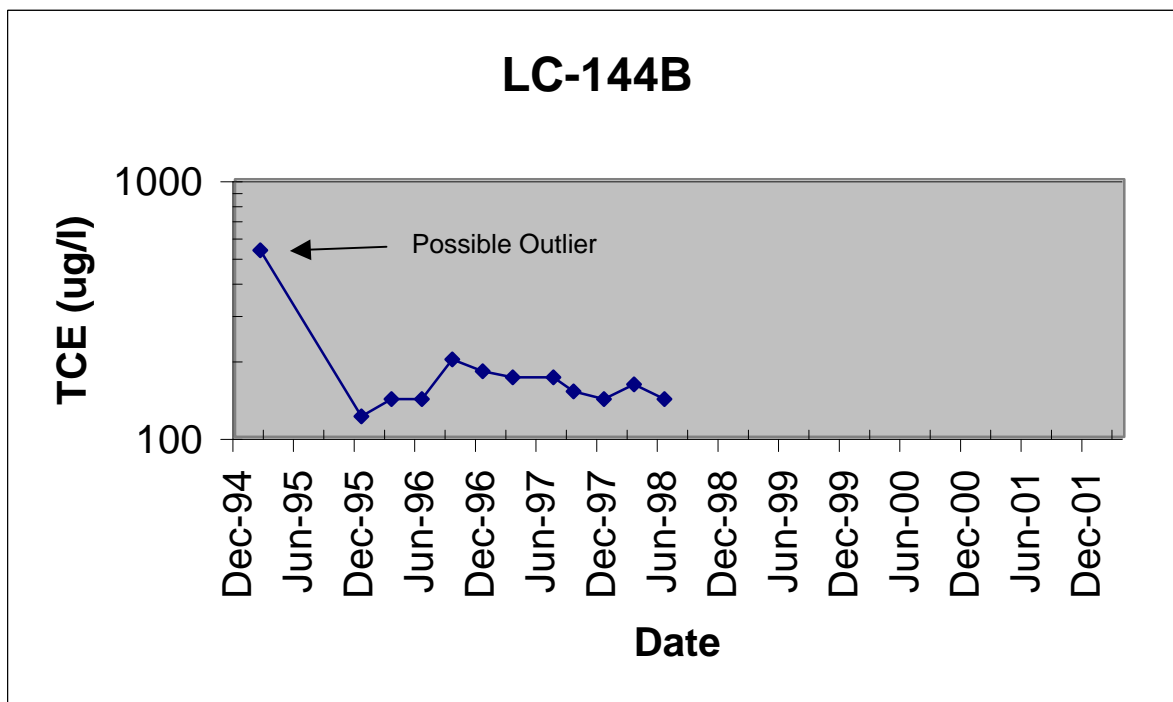


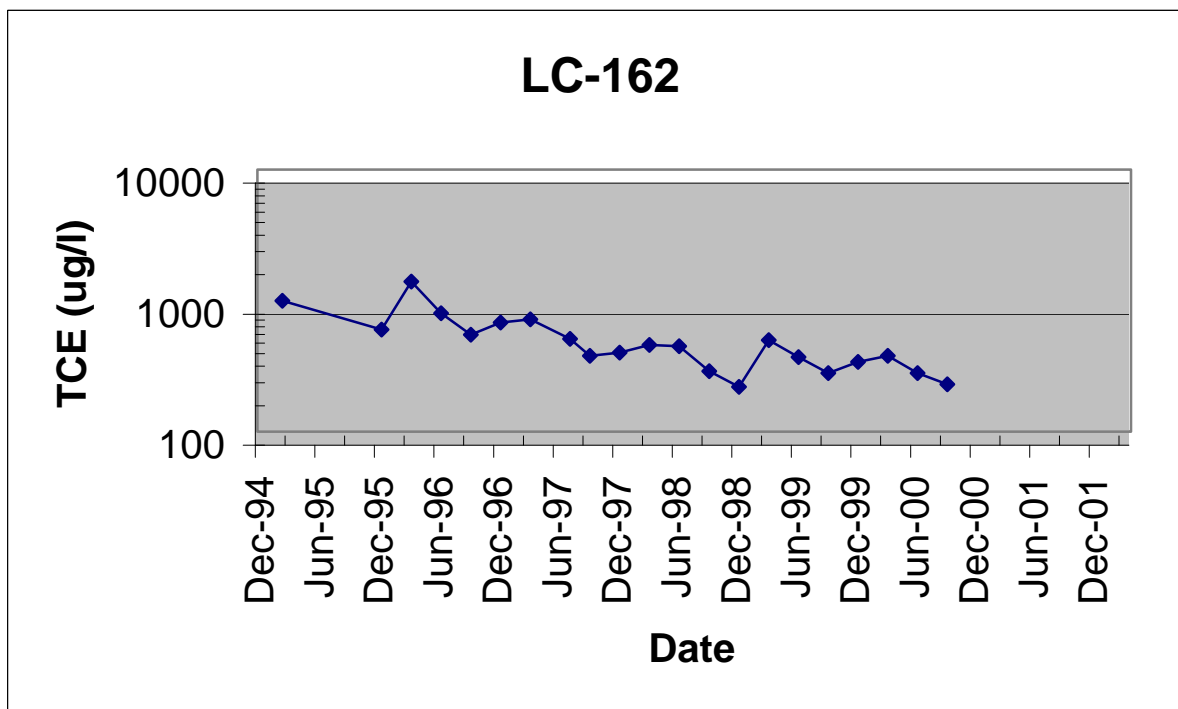
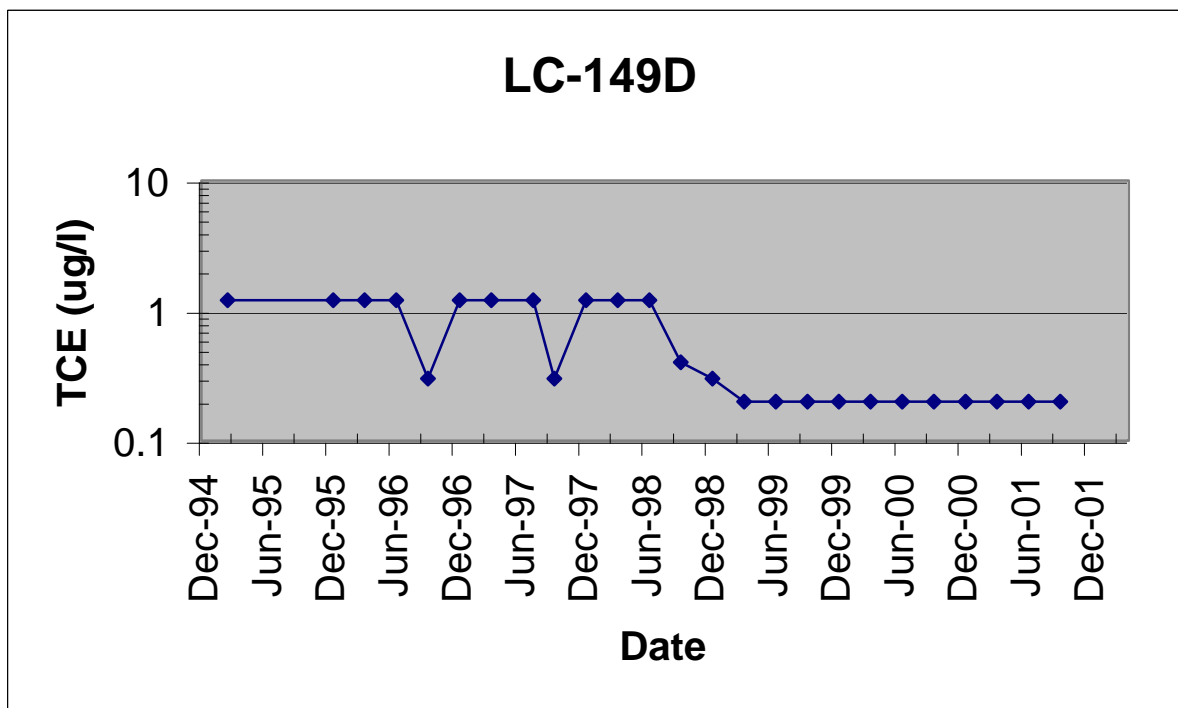


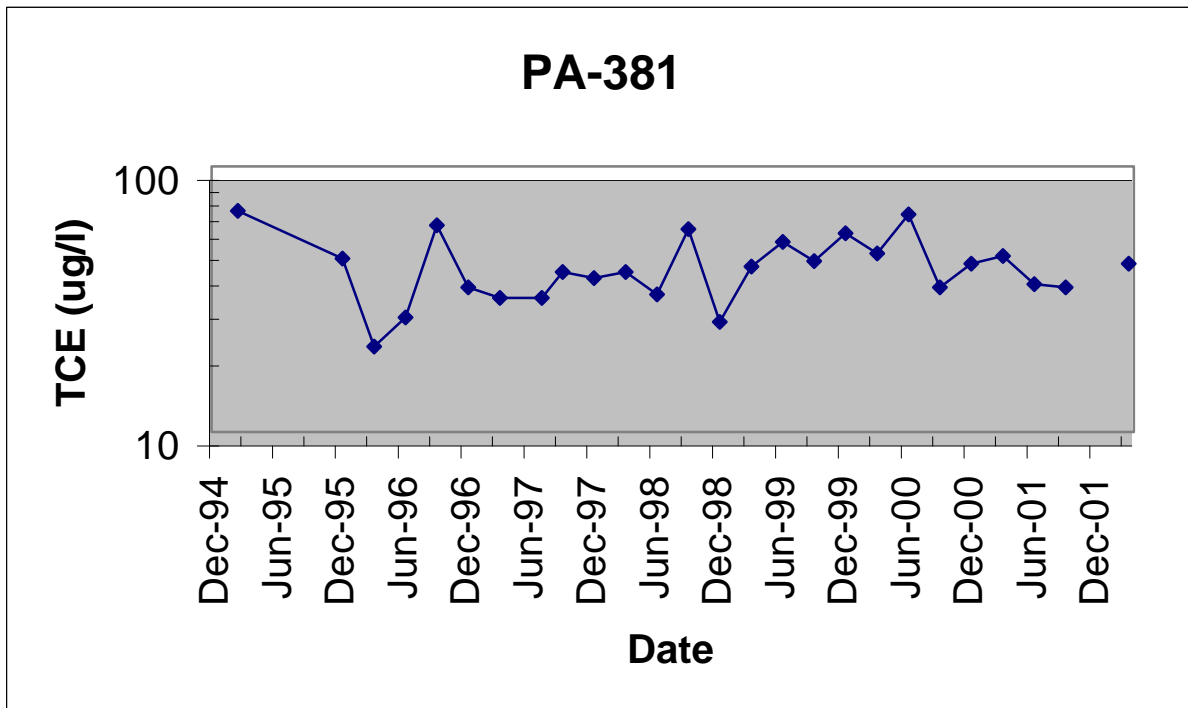
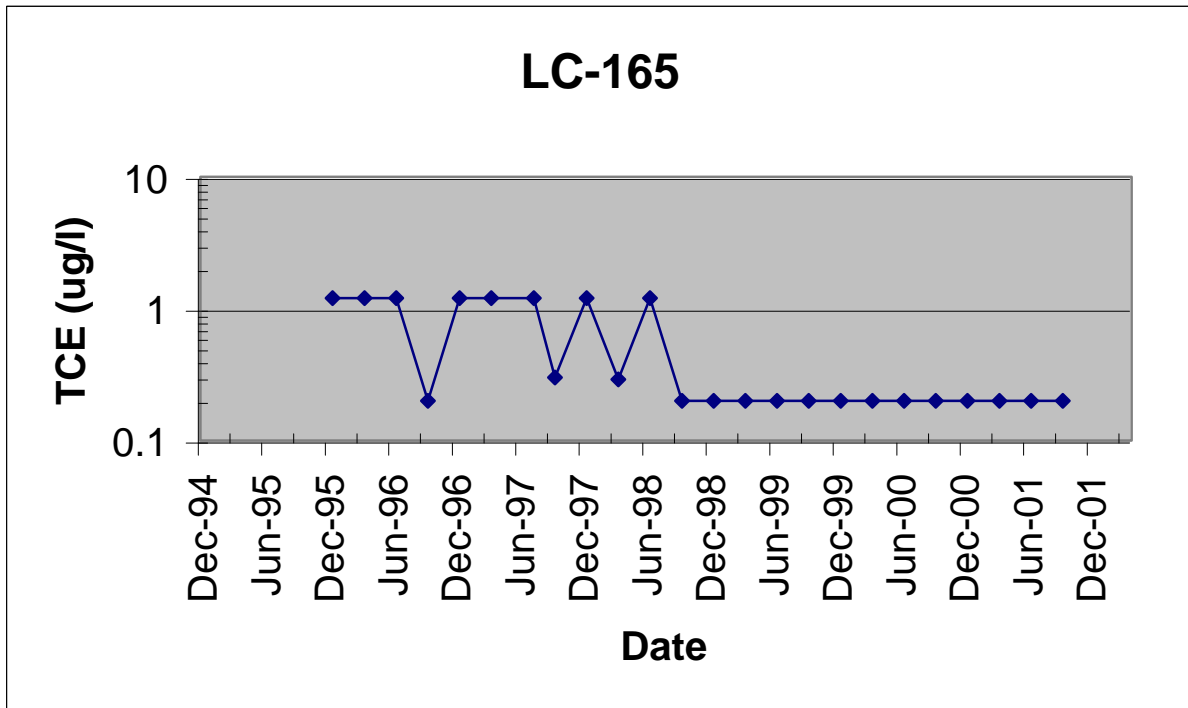


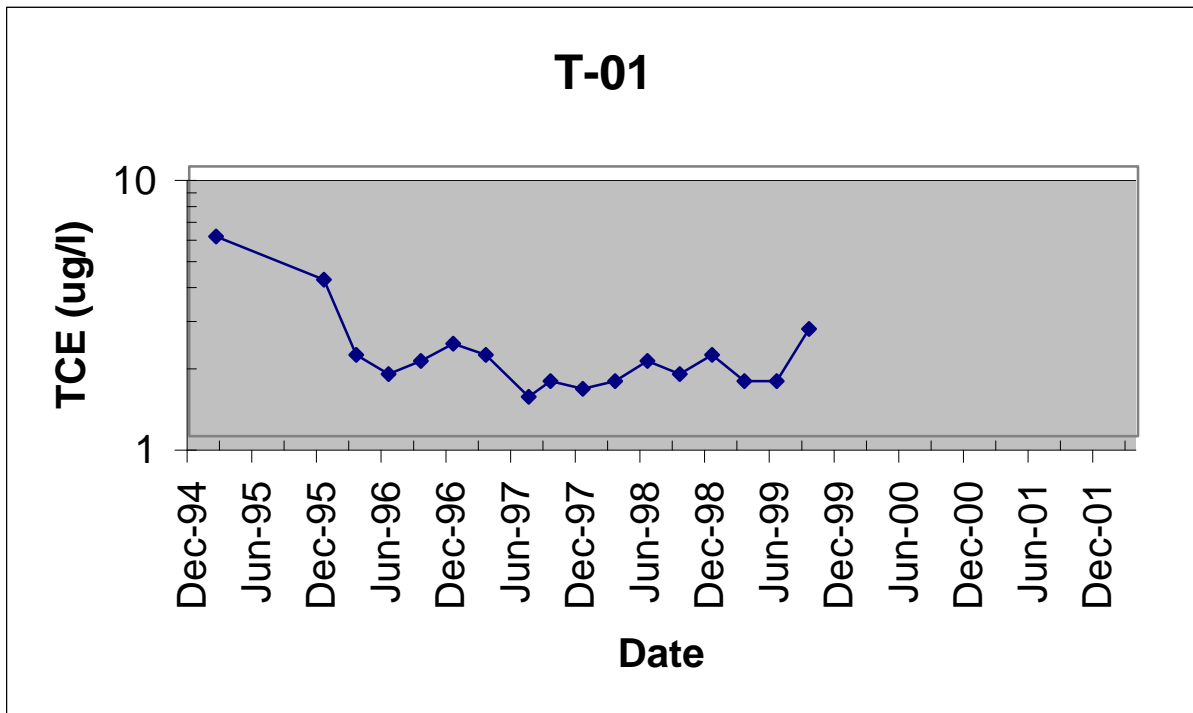
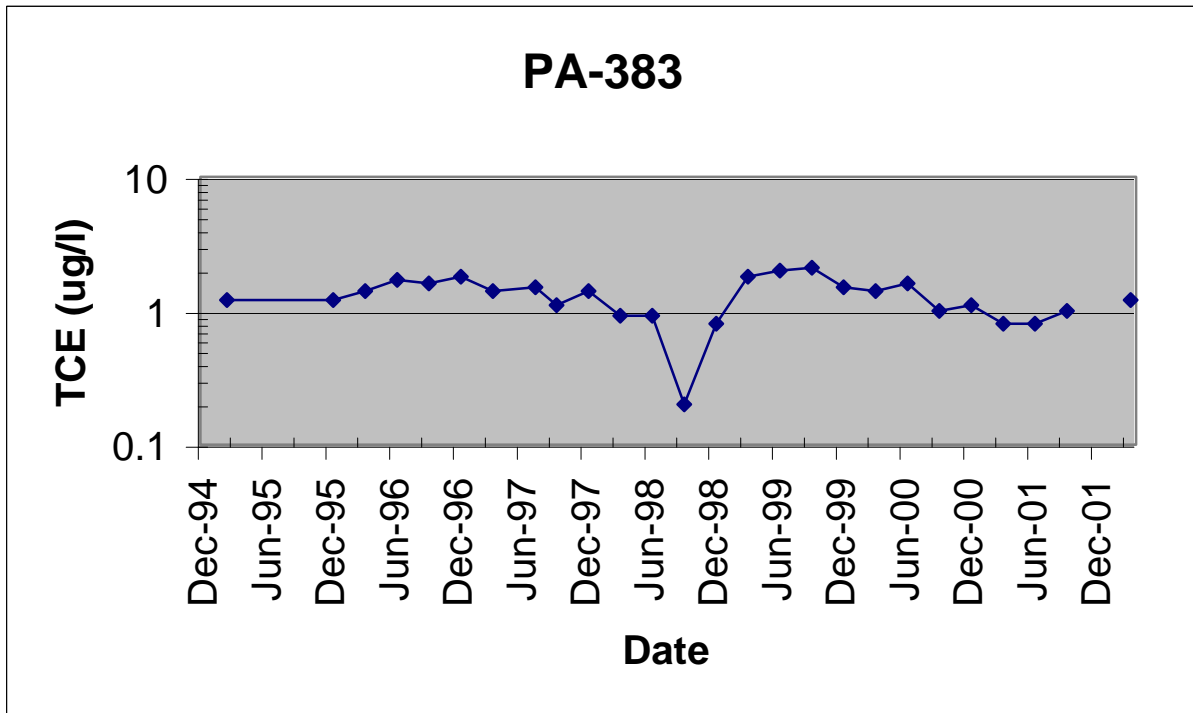


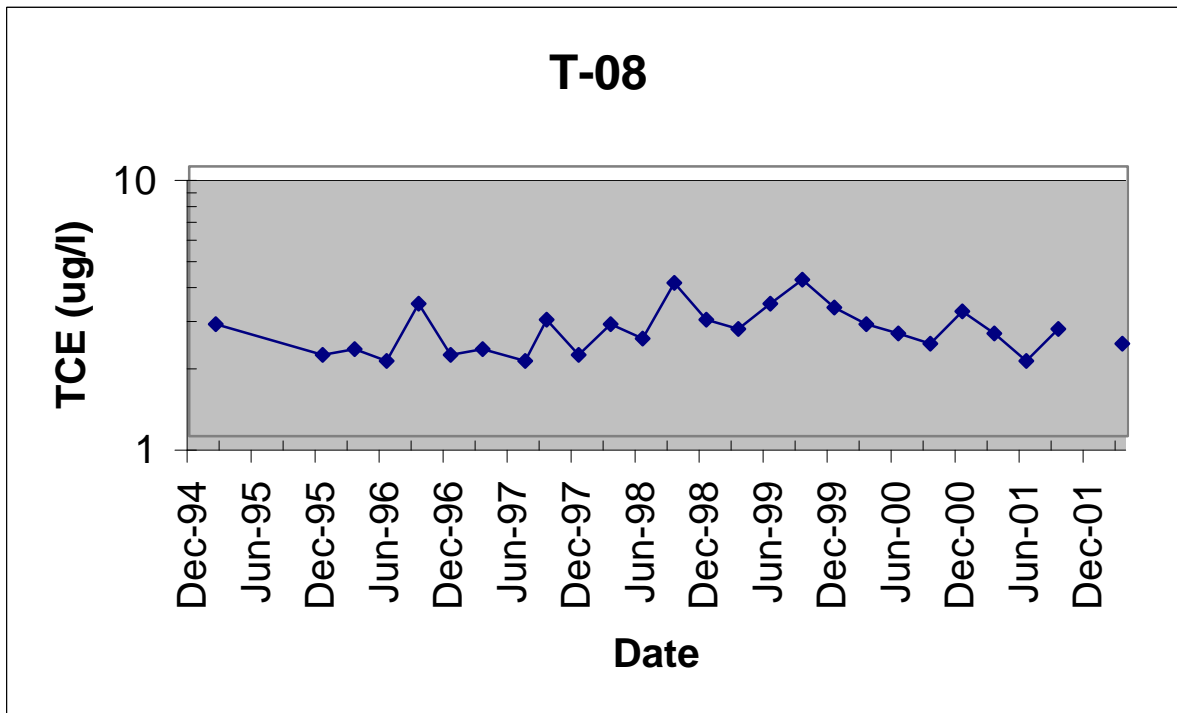
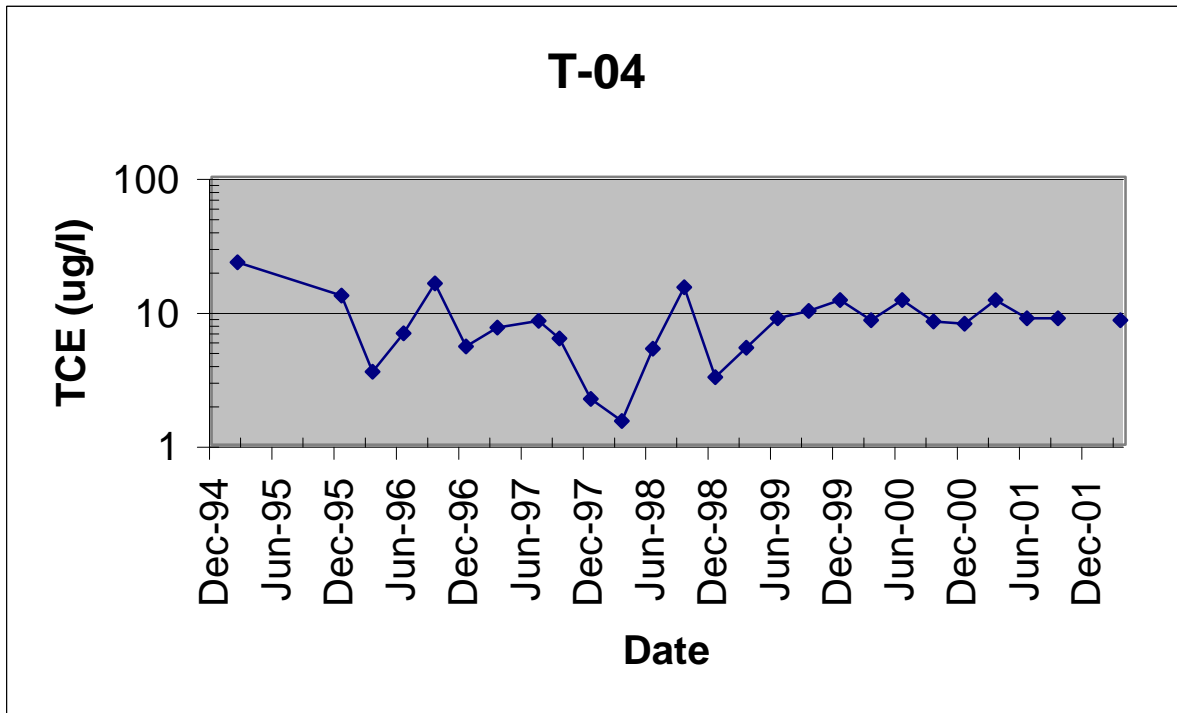


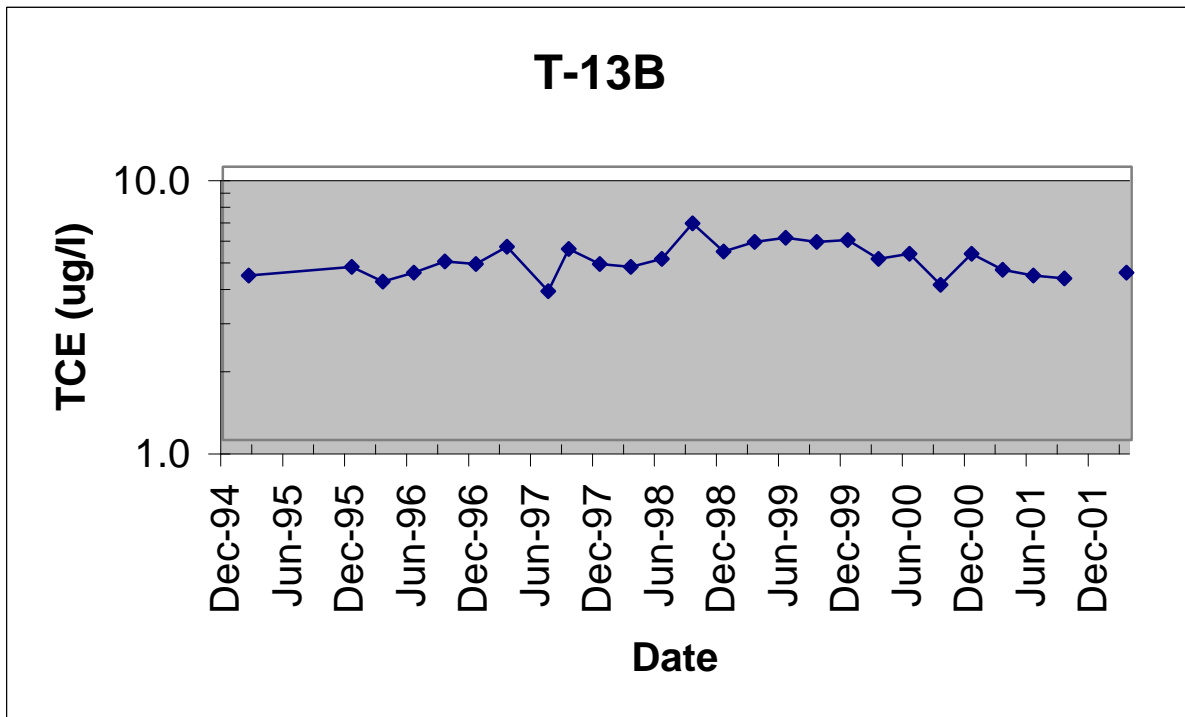
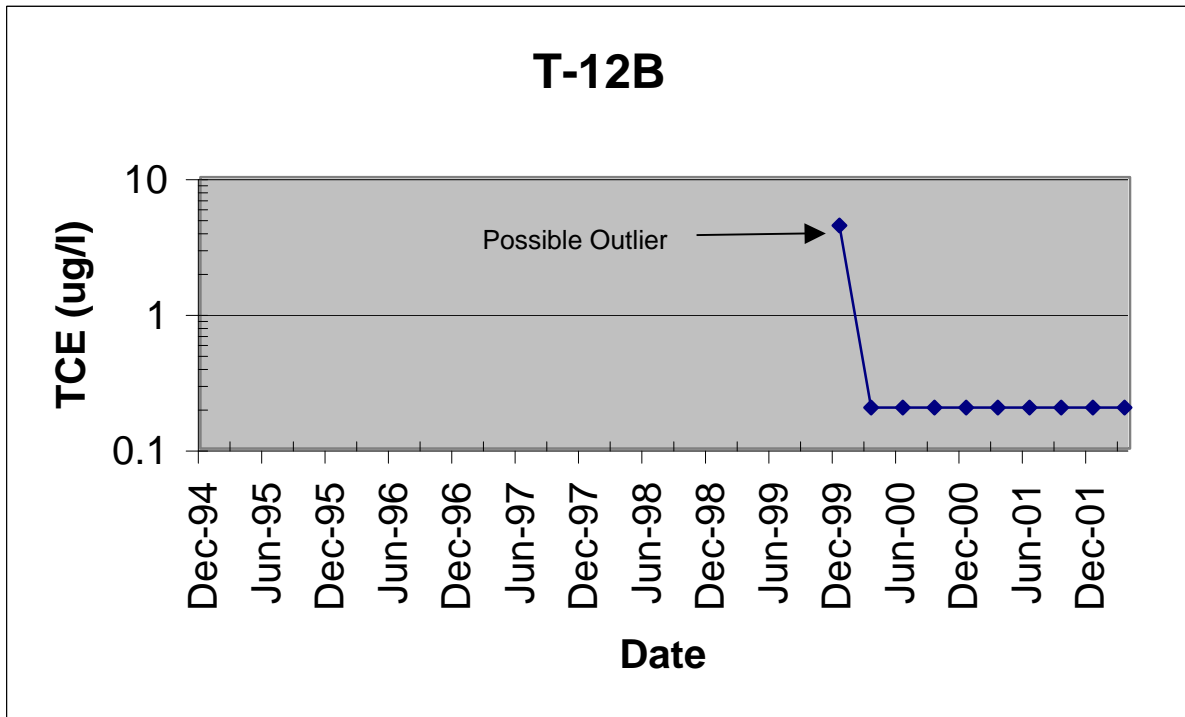


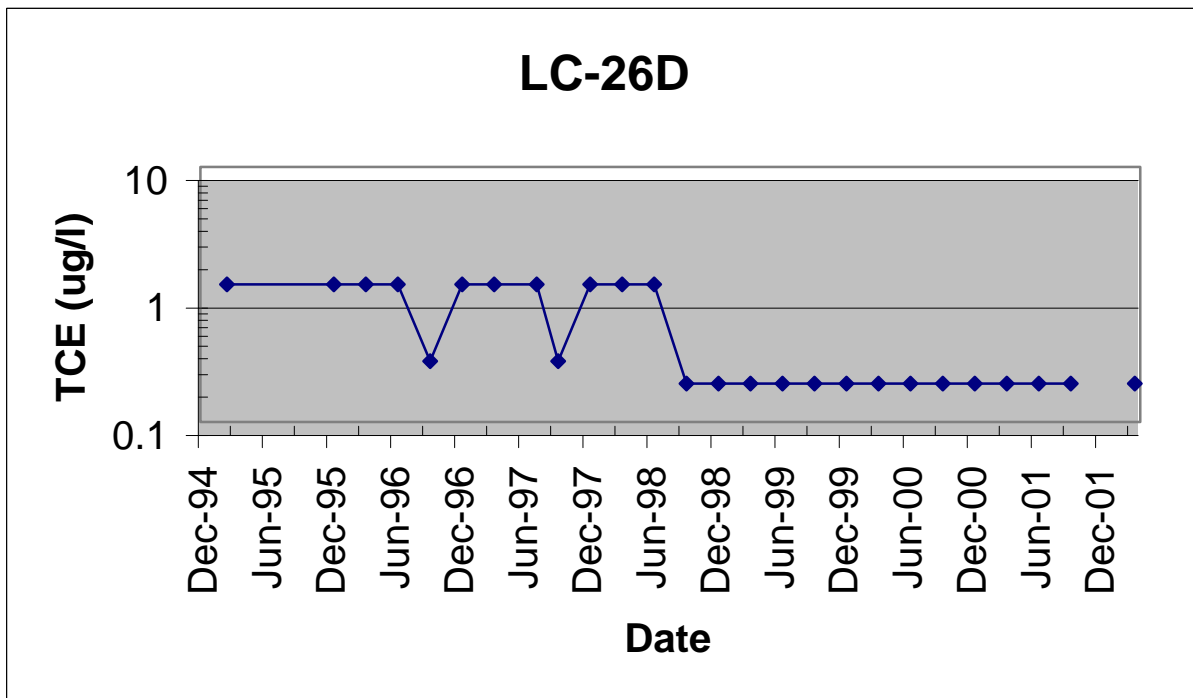
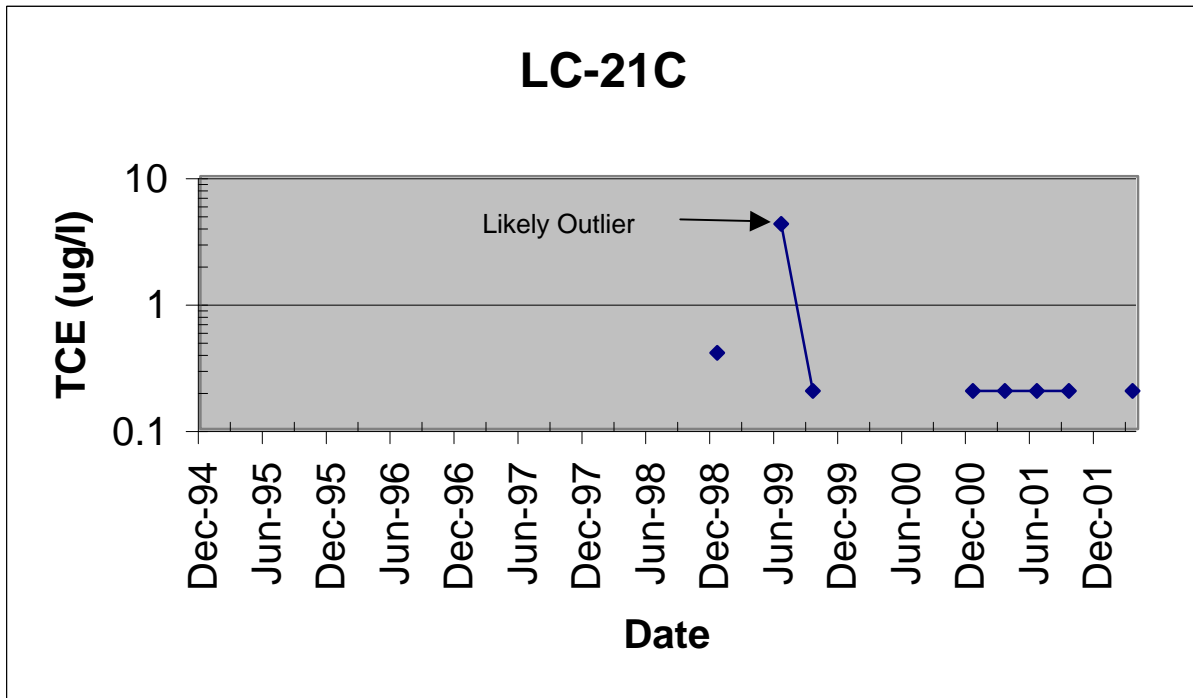


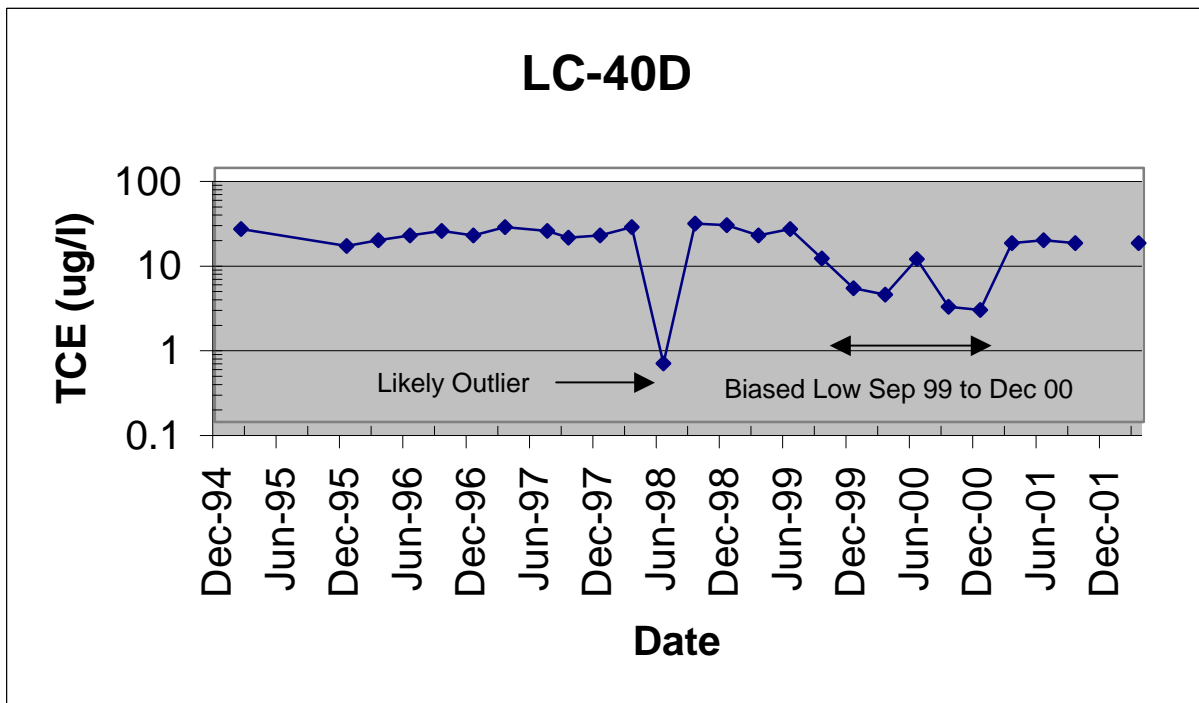
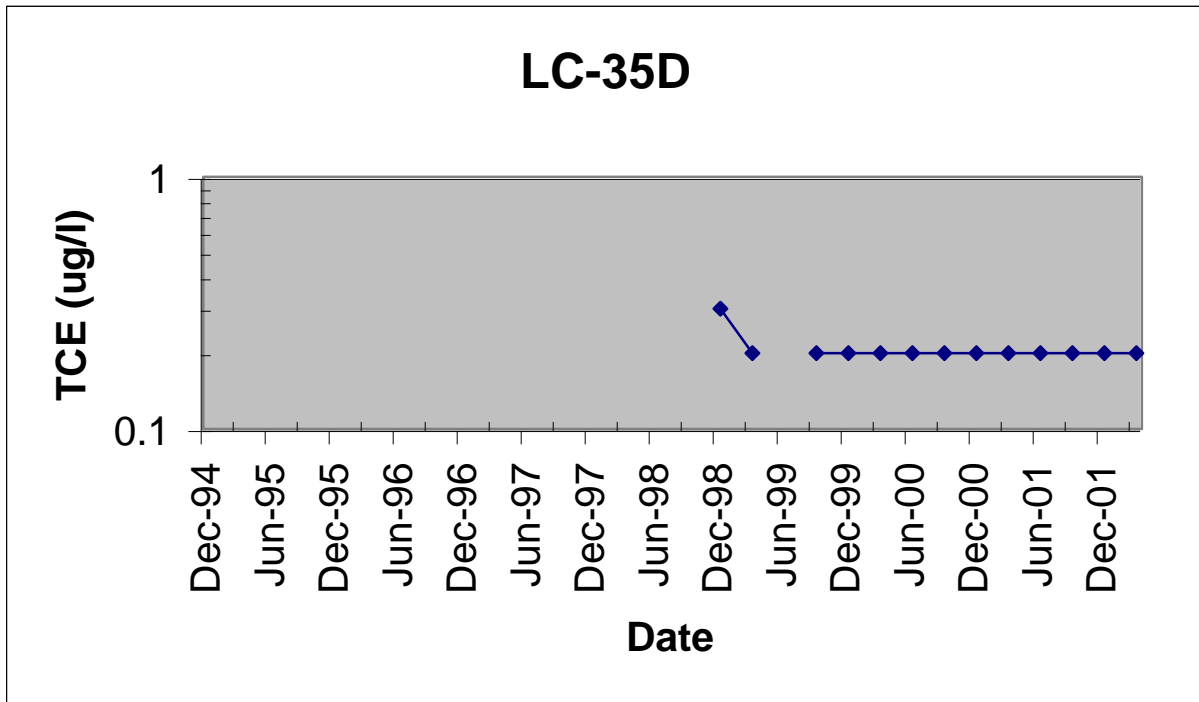


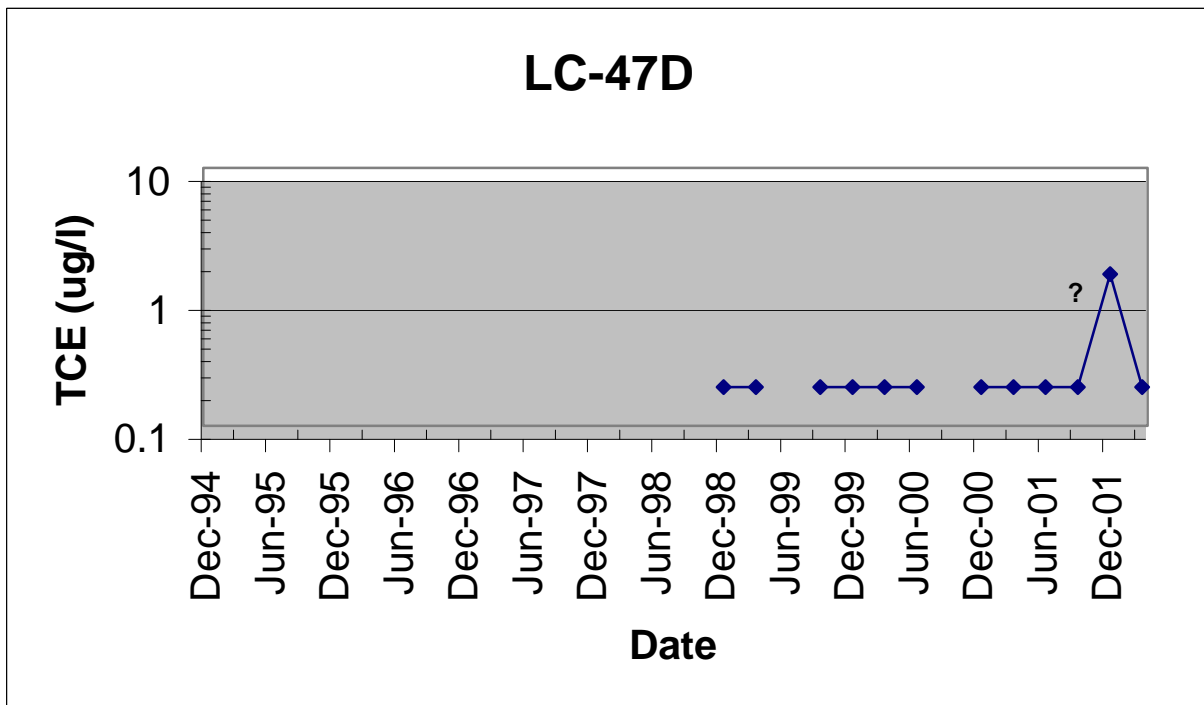
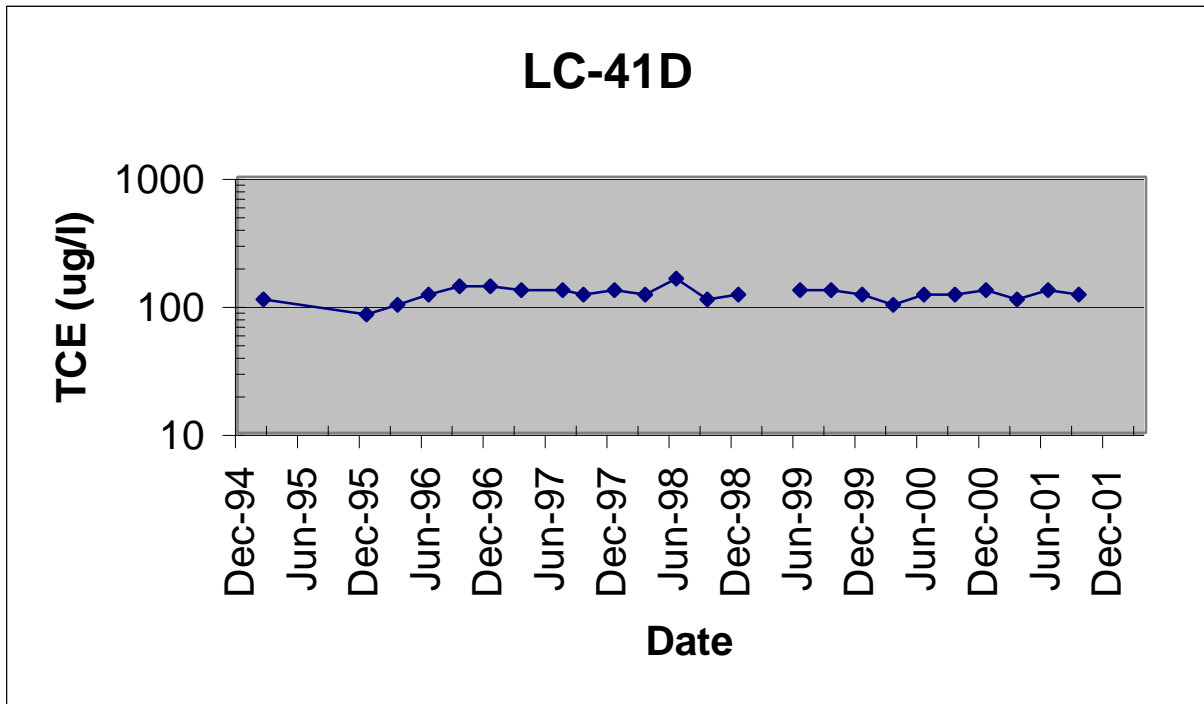


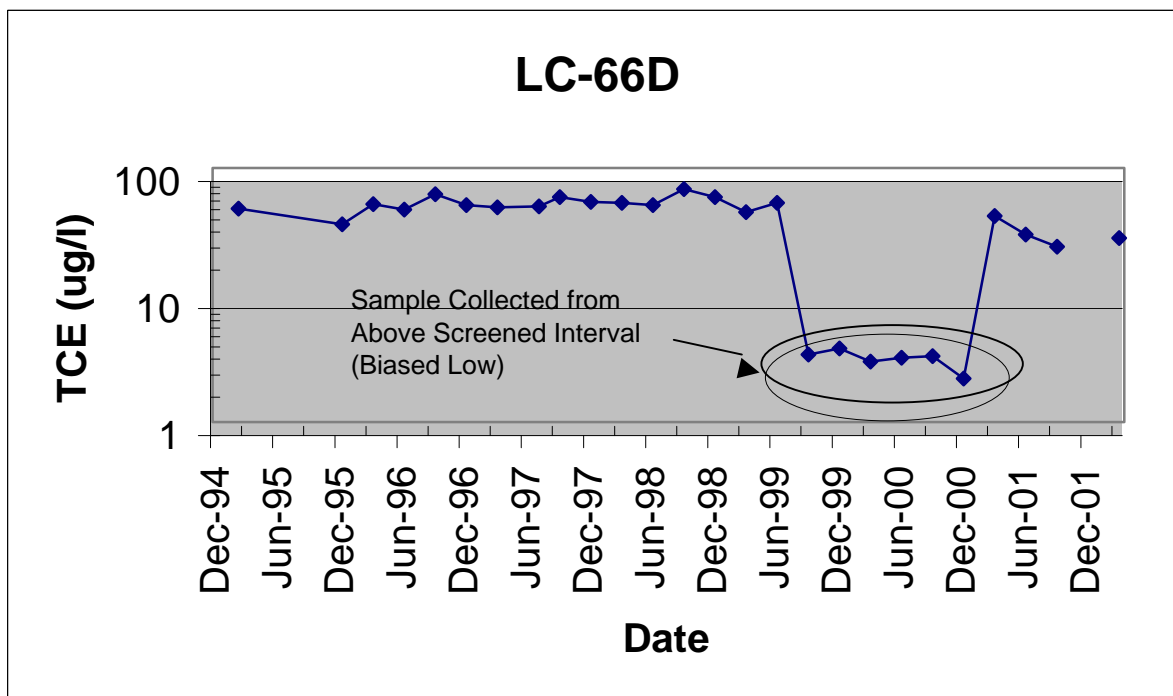
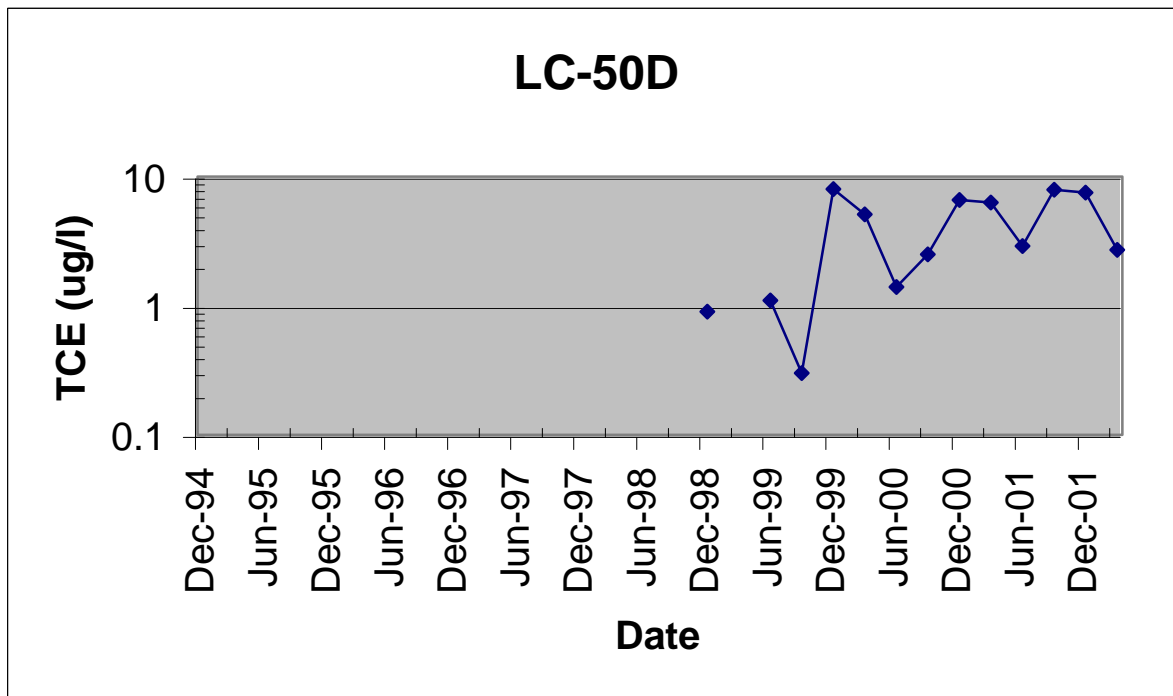


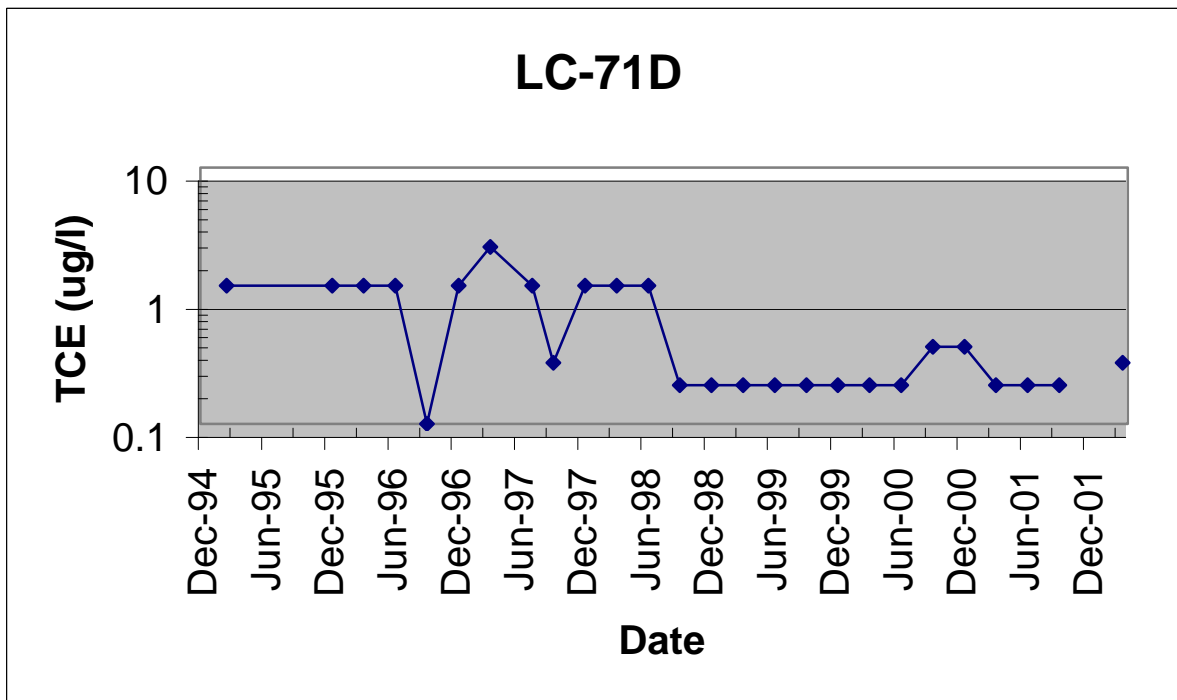
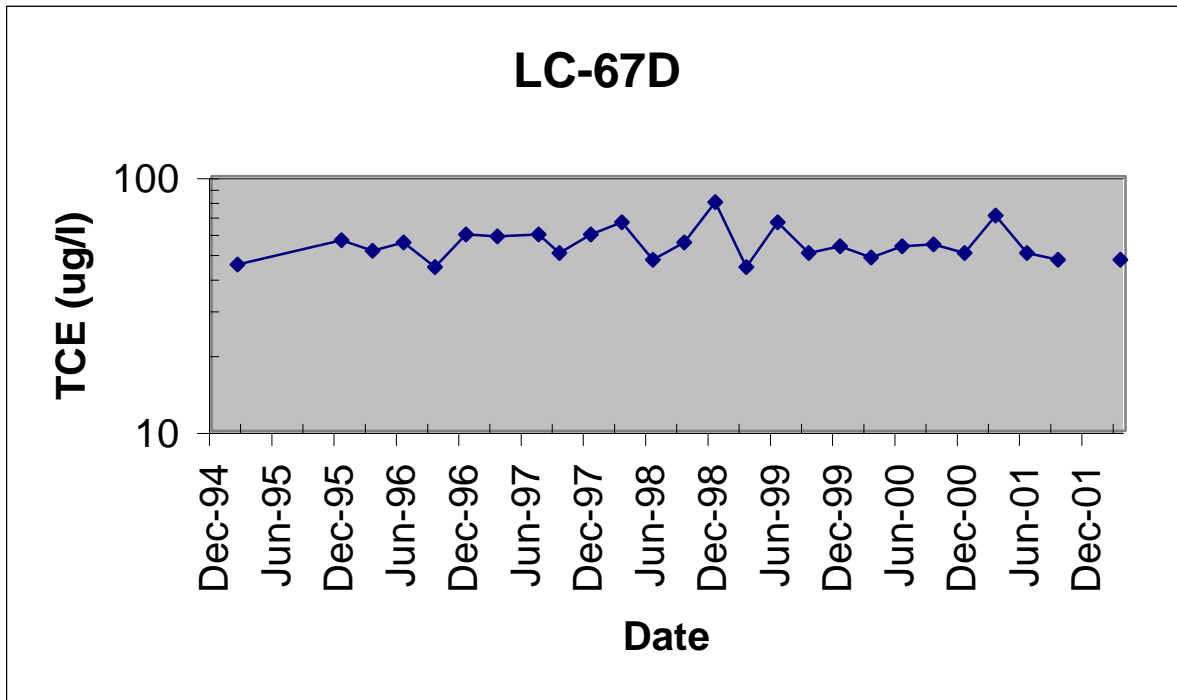


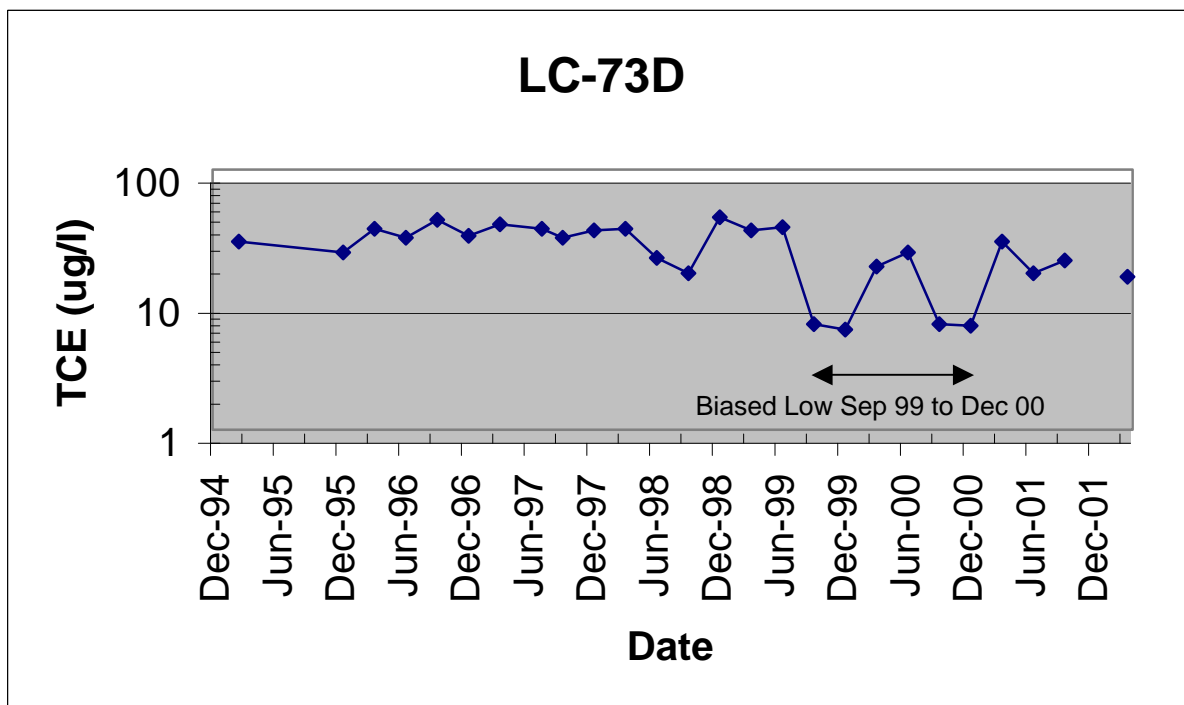
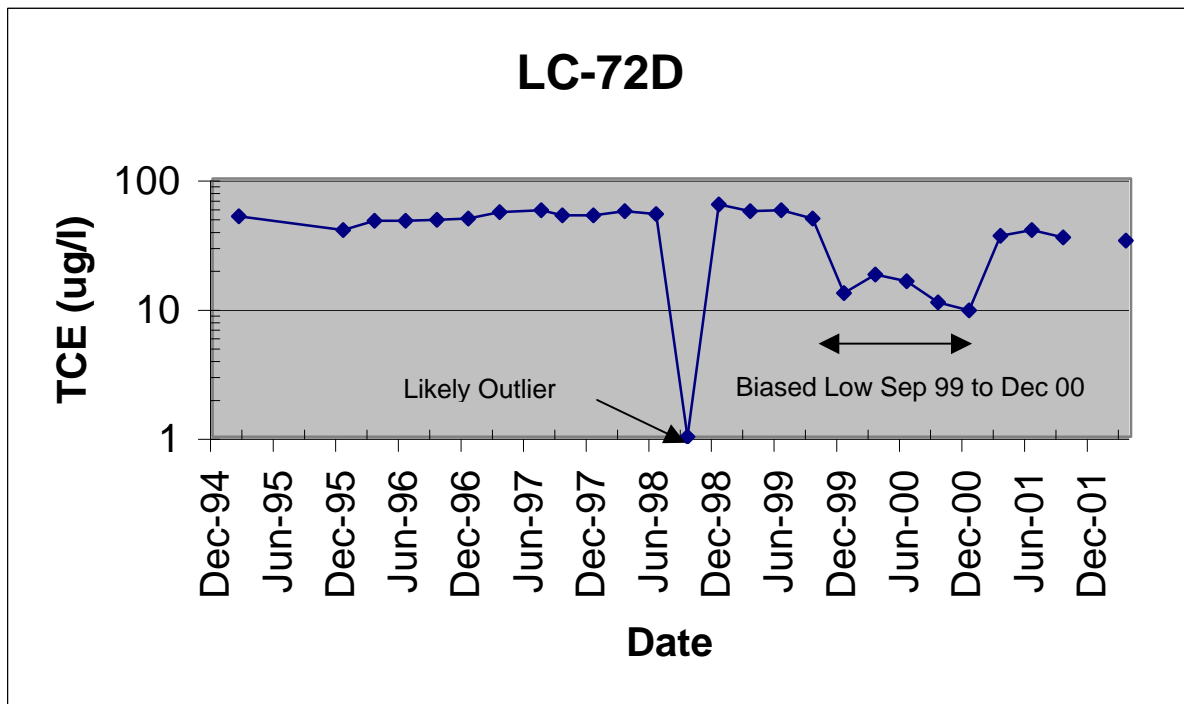


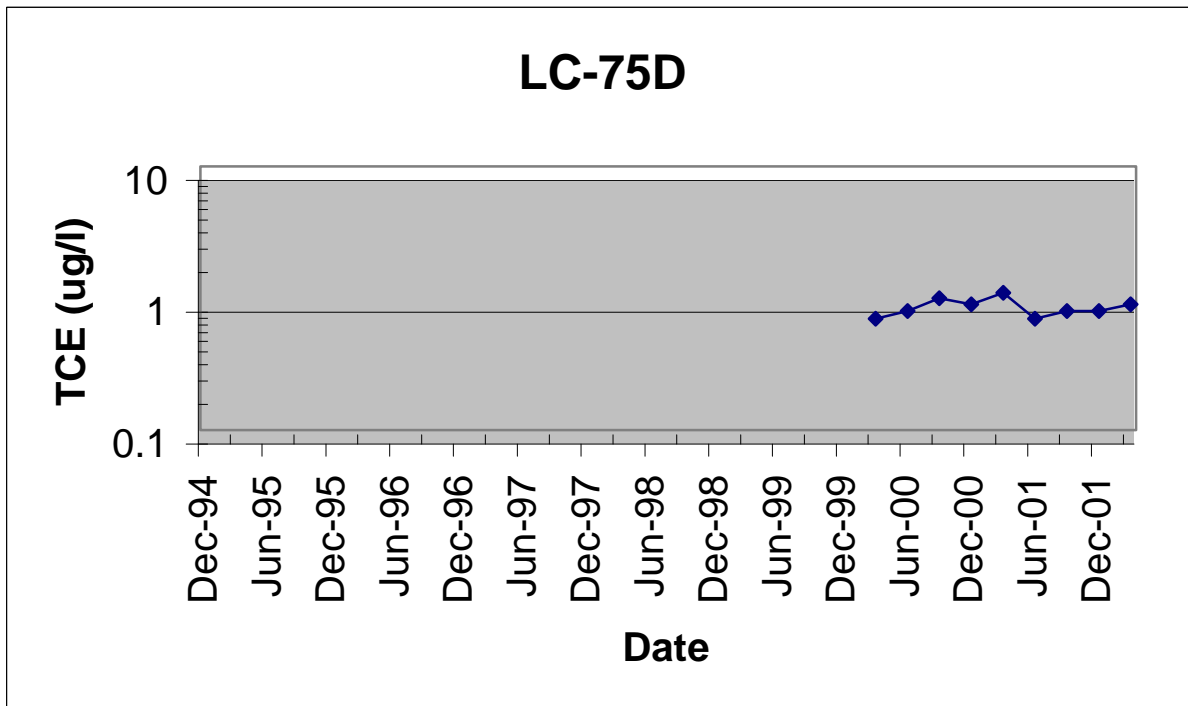
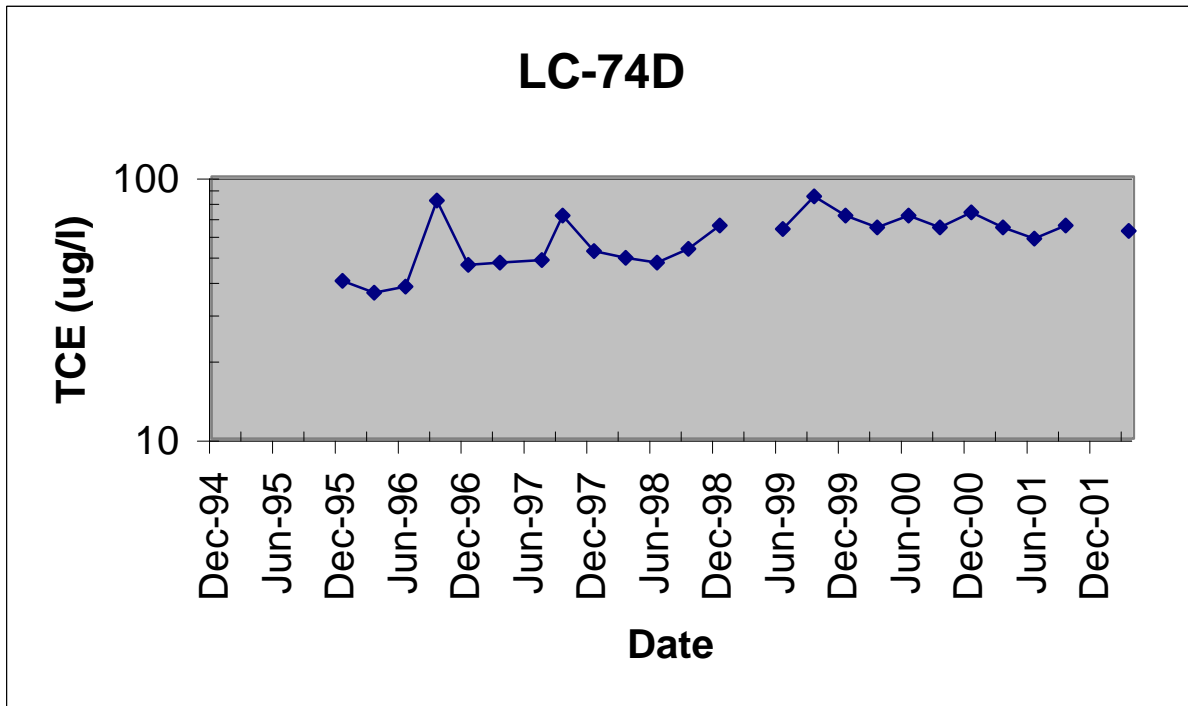


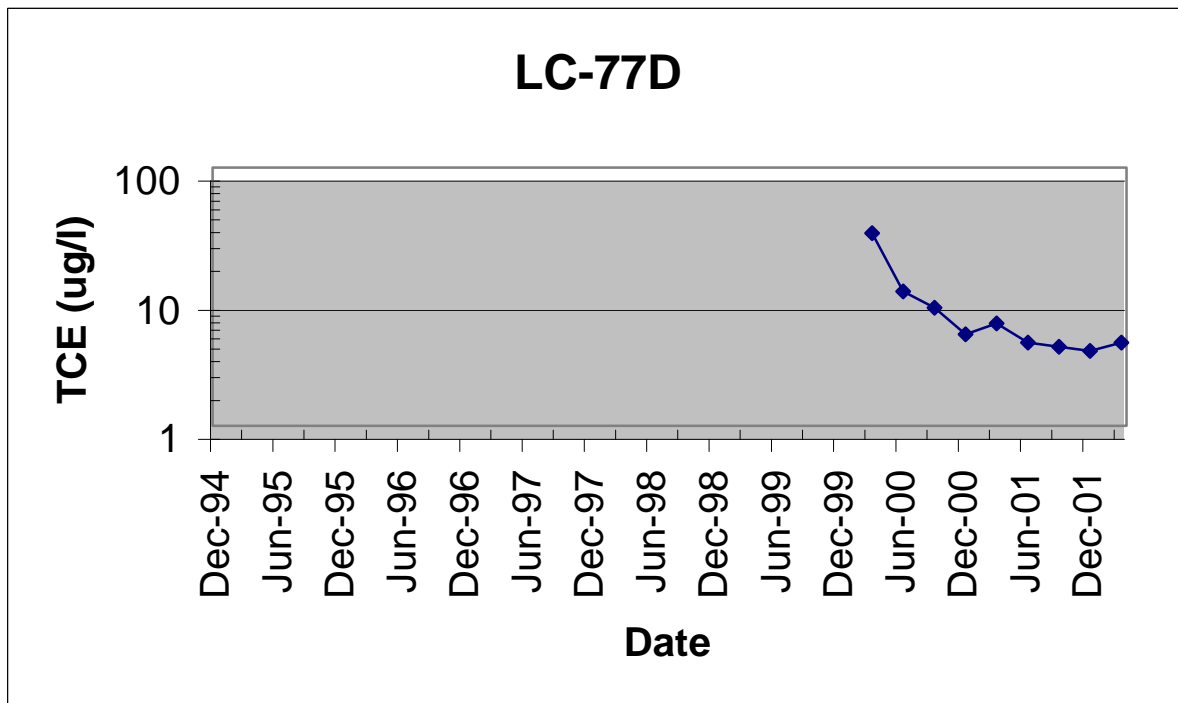
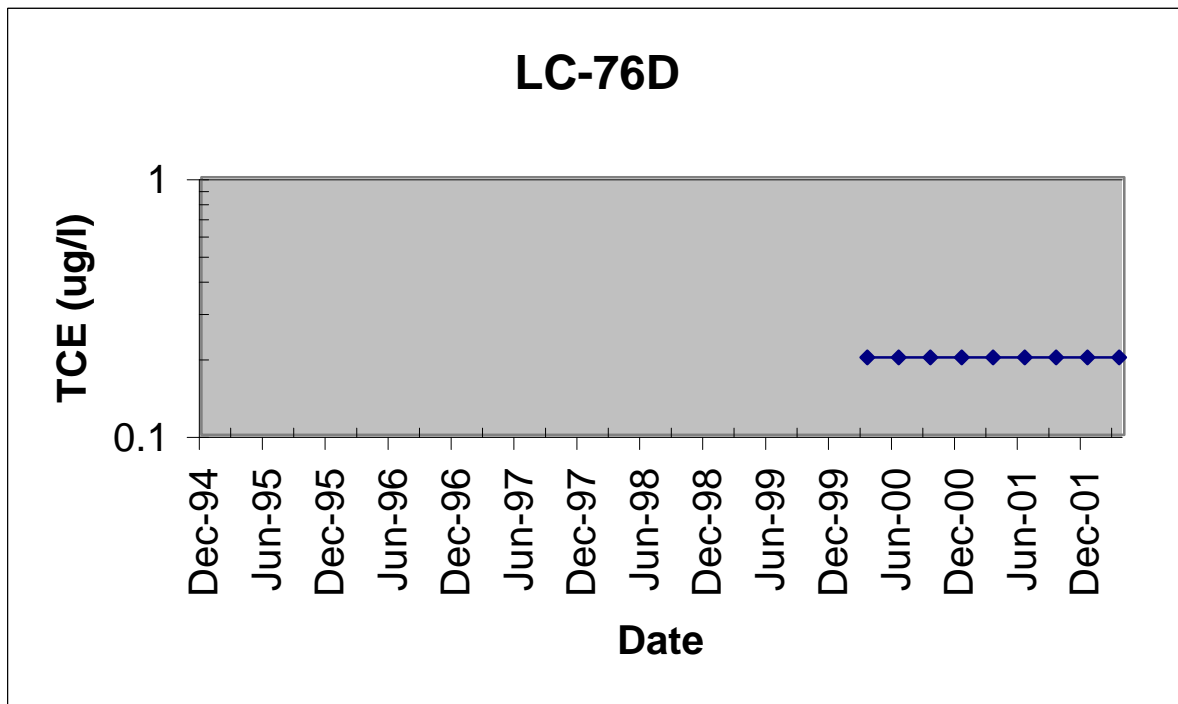


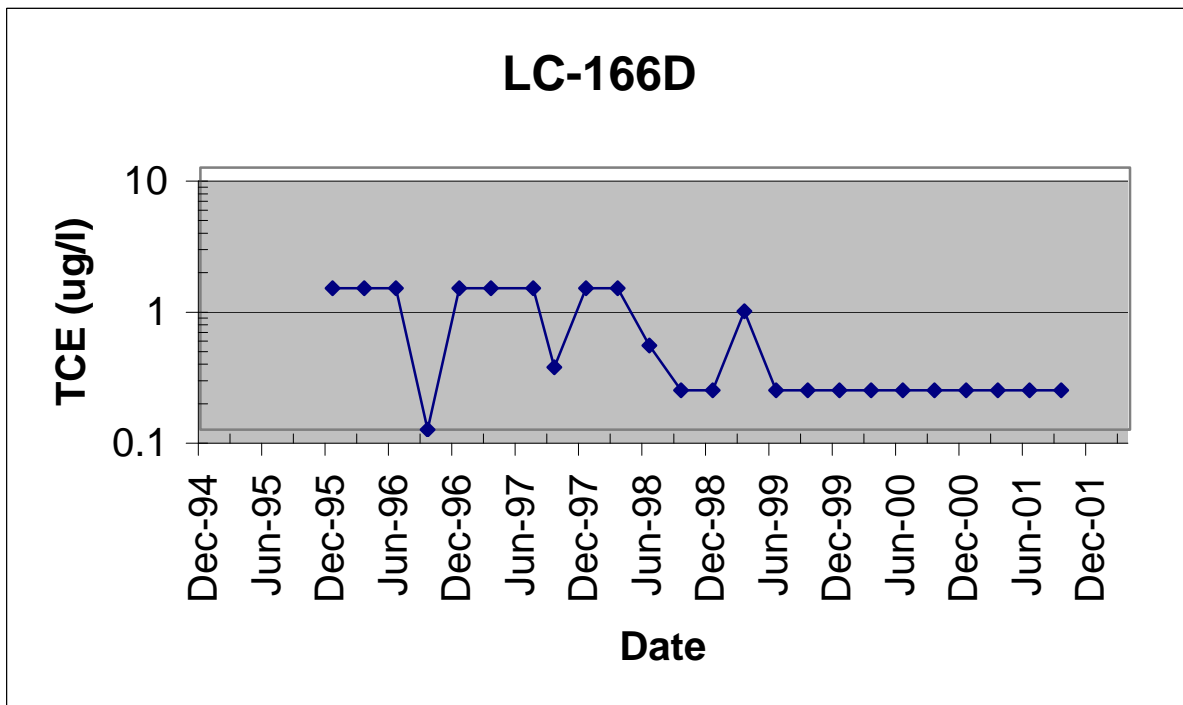
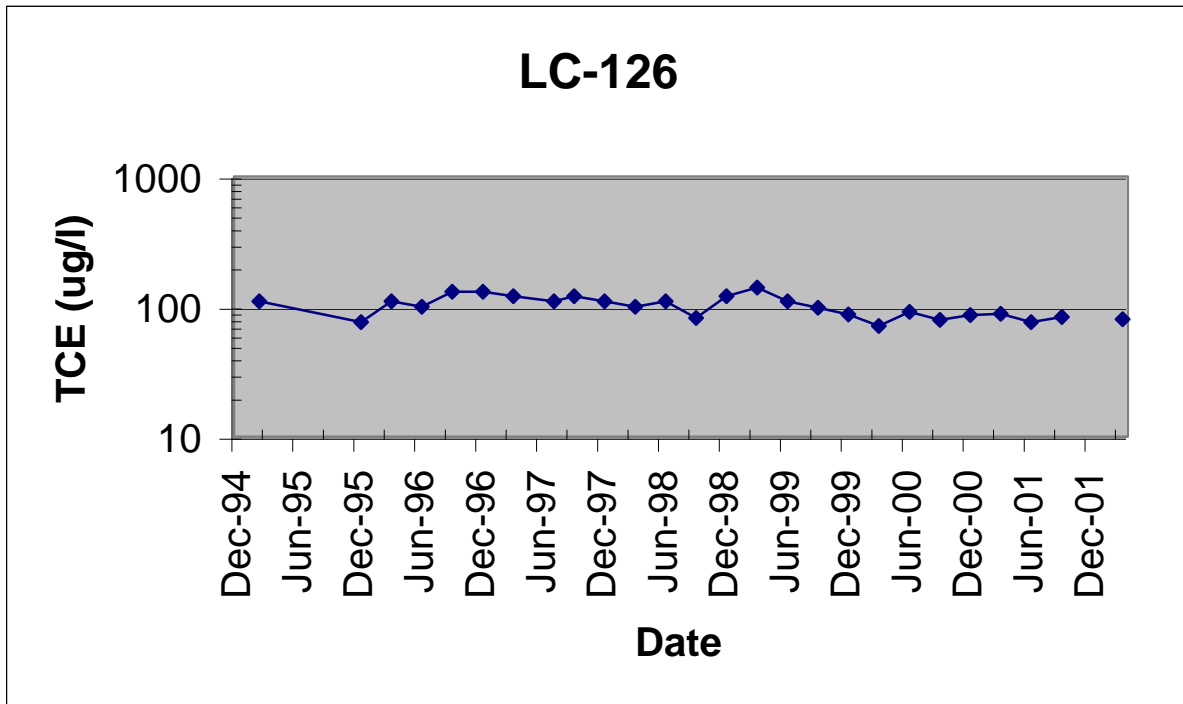


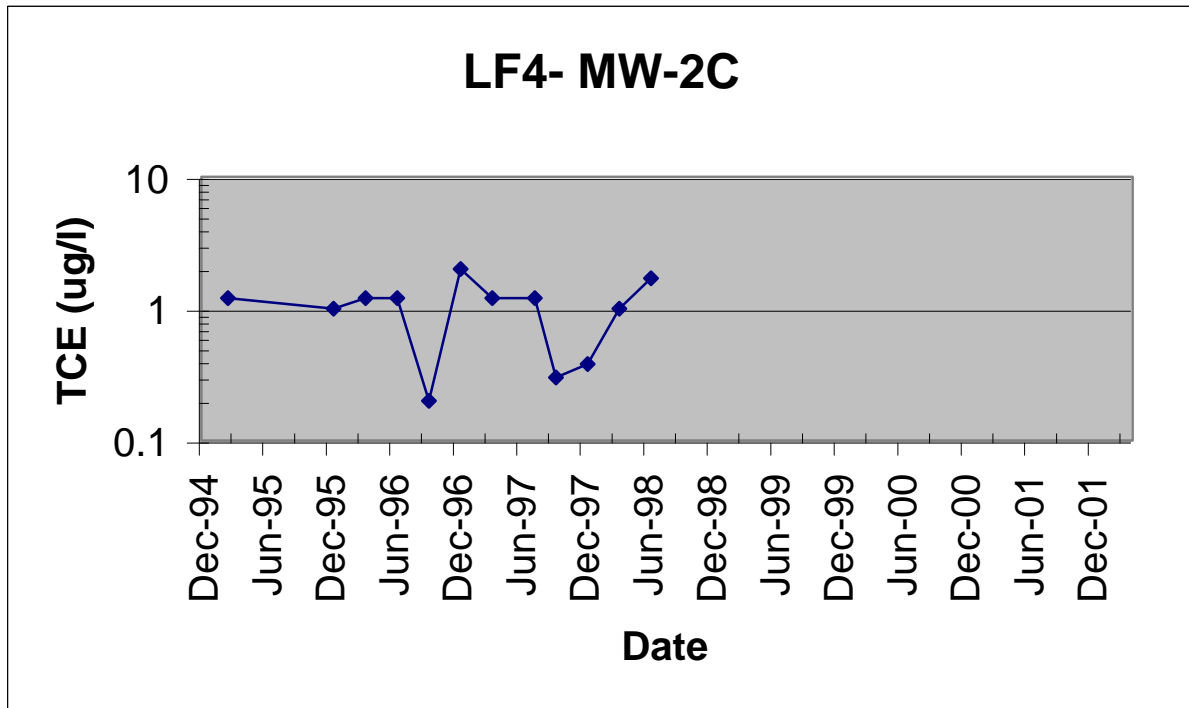


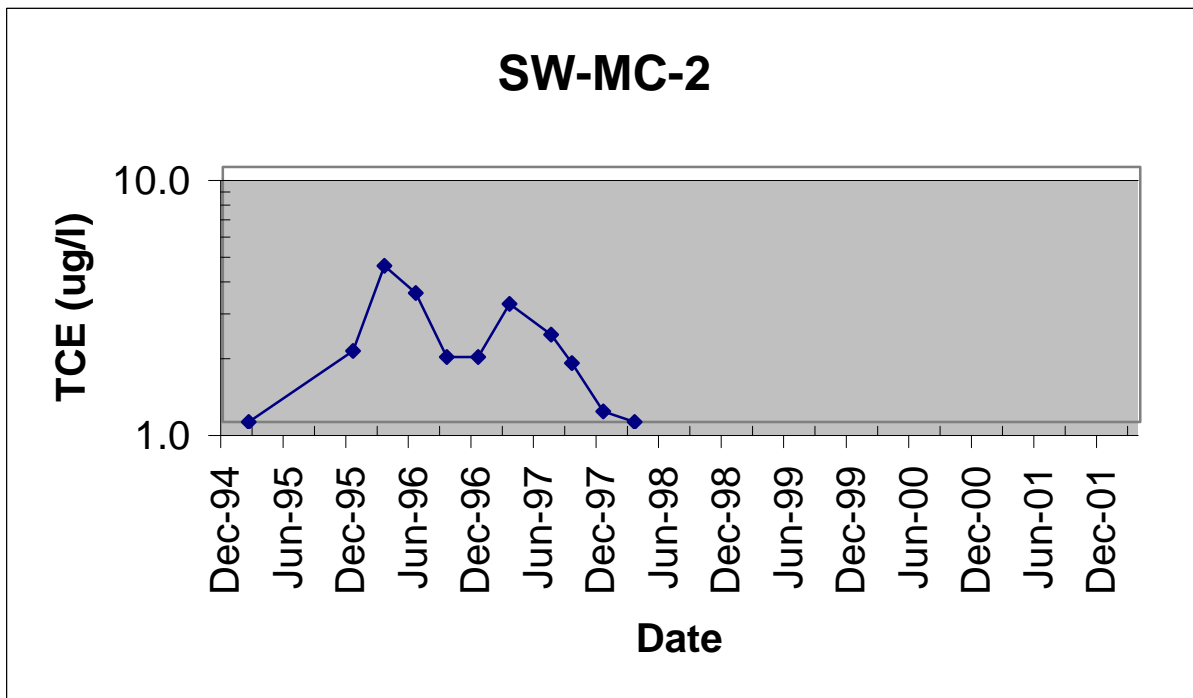
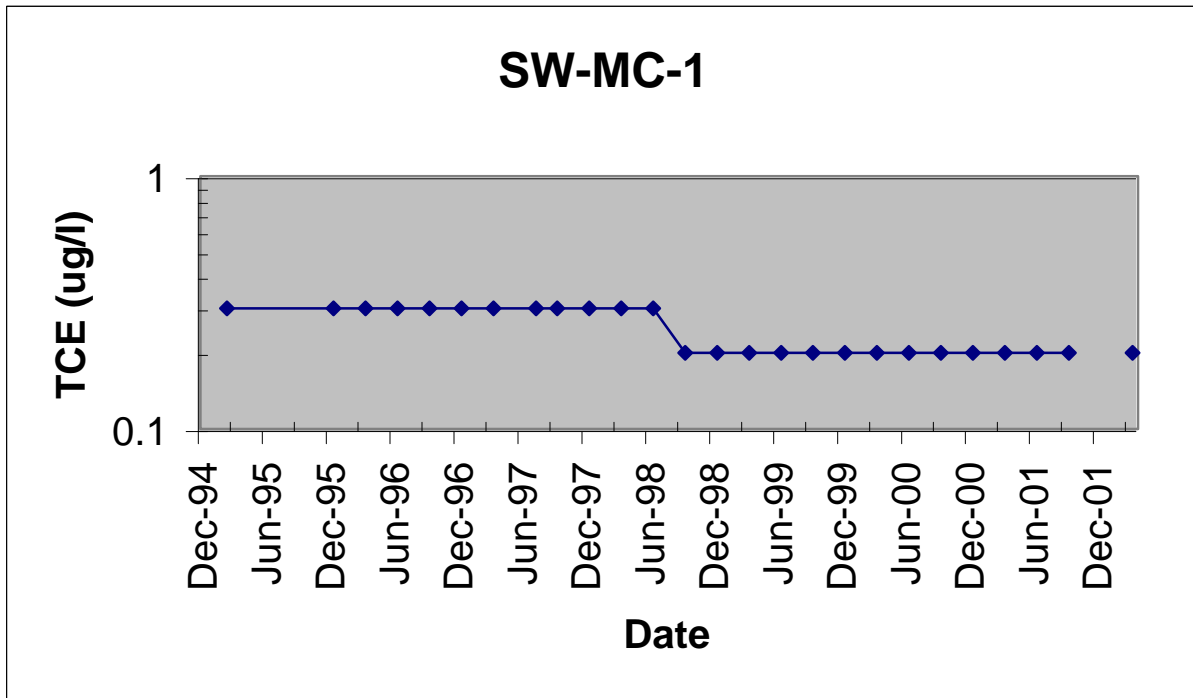


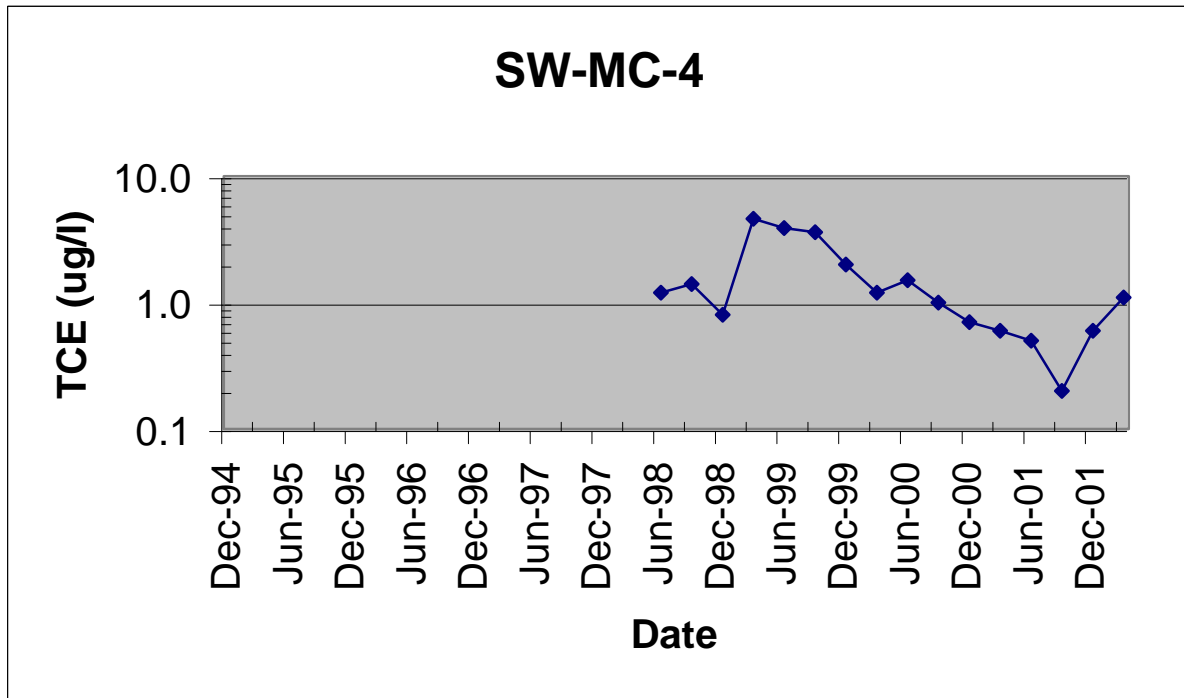












## **Appendix 2**

### **Response to Reviewer Comments**

RESPONSE TO REVIEWER COMMENTS  
FIVE-YEAR REVIEW  
FORT LEWIS LOGISTICS CENTER

*Editorial Note 1: Comments and their respective approved responses will be included in the 5-Year Review Report as “Appendix 2, Response to Reviewer Comments.”*

*Editorial Note 2: In order to apply consistent terminology to hydrogeologic units at the Logistics Center site, all references to the “lower aquifer” in the 5-Year Review Report have been changed to the “Sea Level aquifer” to agree with terminology used in the Draft Phase II RI Field Investigation Report. Also, all references to the “upper aquifer” have been changed to the “Vashon aquifer” in the report. The Sea Level aquifer is the same hydrogeologic unit referred to as the lower aquifer or Salmon Springs aquifer in previous reports, and the Vashon aquifer is synonymous with the upper aquifer used in previous reports.*

EPA COMMENTS ON THE LOGISTICS CENTER FIVE-YEAR REVIEW  
(Received 11 July 2002)

**Comments by Bob Kievit:**

1. Refer to page v, 1<sup>st</sup> paragraph - Please revise the 4<sup>th</sup> sentence to read something like the following in order to avoid the term ‘construction completion’ which has a specific meaning in the Superfund Program: “The groundwater pump and treat system was installed in and has been operating since March 1995.”

RESPONSE: Subject sentence has been revised accordingly. Note that the pump-and-treat system was installed by March 1995; however, operational difficulties prevented the system from being fully operational until August 1995.

2. Refer to page v, 2<sup>nd</sup> para. - The last sentence states that the selected remedy for the Lower Aquifer is no longer a groundwater pump and treat system. Please note that the ESD did not eliminate the potential use of pump and treat for the Lower Aquifer for the future. At the time the ESD was written we did not have sufficient information regarding the Lower Aquifer contamination to decide on a cleanup remedy. The ESD did indicate that the Army should concentrate on cleaning up the source of contamination (EGDY) and on speeding up cleanup efforts on the Upper Aquifer while conducting additional studies on the Lower Aquifer. Attached are EPA’s comments dated March 1998 on a draft ESD which may provide more insight regarding EPA’s position on the Lower Aquifer.

RESPONSE: The last sentence in subject paragraph has been revised to read, “The ESD stated innovative technologies would be used to expedite cleanup of the Logistics Center

site, in particular the East Gate Disposal Yard (EGDY) source area, and that additional studies of the lower aquifer were to be conducted.”

3. Refer to pg. v, 3<sup>rd</sup> para. - Please add “and in soils” after “...in the groundwater...” in the first sentence.

RESPONSE: Subject sentence has been revised to include soils in addition to groundwater.

4. Refer to pg. v, 4<sup>th</sup> para. - The first sentence is not accurate. The original ROD remedy is not functioning as designed and that necessitated the ESD. The remedy included in the ESD has not been fully installed and therefore cannot be considered to be functioning.

RESPONSE: The remedy referred to in the first sentence of the fourth paragraph was the pump-and-treat system only, not P&T and source removal/treatment. The text has been revised to reflect that the remedy as a whole (groundwater extraction and treatment and aggressive source area removal/treatment) is not functioning as designed based on the decision documents (the ROD, as amended by the ESD) because the source area treatment has not yet been implemented.

5. Refer to pg. viii, Issues - I think the major issue is that the pump & treat remedy was not meeting the goals expressed in the ROD; therefore it was determined that other actions needed to be taken such as cleaning up the EGDY, exploring other technologies that would speed up remediation of the Upper Aquifer, and increasing performance of the pump & treat system. This section, as written, addresses only making improvements to the pump & treat system.

There should be at least 1 action in the Recommendations and Follow-up Actions section for every issue discussed in the Issues section. However, it is possible to have recommendations and follow-up items that are not related to an issue.

RESPONSE: The major issue in the issuance of the ESD with regard to the upper aquifer was that it was apparent that pump-and-treat alone would not remediate the aquifer to beneficial use within the stated 30-year timeframe, and so the other actions listed in your comment were proposed in the ESD to speed up remediation. This issue has been added to the Issues/Recommendations and Follow-up Actions on the Five-Year Review Summary Form.

One recommendation and/or follow-up action has been stated for each issue in the Five-Year Review Summary Form. Additionally, all issues listed in Tables 16 and 17 are now summarized on the 5-Year Review Summary Form.

6. Refer to pg. 1, 1<sup>st</sup> para. - This purpose statement is too narrow. The review should address (and has addressed) more than the GETS system. The ROD remedy includes more than the GETS system and the site includes more than the Log Center TCE plume.

RESPONSE: The remedy selected in the ROD was “Alternative 3 – Extract and Treat Downgradient of the Logistics Center and Near Source Areas.” In addition to the GETS

components, the remedy included administrative and institutional controls, lower aquifer investigation, and source soil identification and characterization. Also it is recognized that, in addition to the ROD, remedy within the ESD is to also be included in the 5-Year Review purpose. Purpose statement will therefore be broadened to encompass the items mentioned above.

7. Refer to pg. 2, 3<sup>rd</sup> para. - Soils are also above cleanup levels.

RESPONSE: Reference to soils above cleanup levels will be added to text.

8. Refer to pg. 2, 4<sup>th</sup> para. - This paragraph should also mention that the Solvent Refined Coal Pilot Project operable unit has been successfully cleaned up to treatment standards and requires no Five-Year Reviews. More importantly, the Five-Year Review should address other areas or operable units covered by the Logistics Center ROD and the IAG (except for Landfill No. 5 which is a separate NPL site). The East Gate Disposal Yard and Logistics Center TCE plume is the most significant OU and should dominate the Five-Year Review Report; however there needs to be some discussion of the smaller problems.

RESPONSE: The successful clean up of the Solvent Refined Coal Pilot Project operable unit has been added to this section. A brief discussion regarding other operable units covered by the Logistics Center ROD and the IAG has been included in the 5-Year Review.

9. Refer to pg. 3, Table 1, 6<sup>th</sup> Event - The stated purpose of the pump & treat system is not quite correct. The ROD stated that the goal of the remedial action is “to restore groundwater to it’s beneficial use, which is at this site, a drinking water source.”

RESPONSE: Verbiage regarding the ROD in Table 1 was taken from Table 3-1 of the Final Phase II RI Management Plan. Text within Table 1 of the 5-Year Review has been revised to reflect the purpose as stated in Comment 9 above.

10. Refer to pg. 5, 2<sup>nd</sup> para. - What is the basis for the 4<sup>th</sup> sentence concerning an “older, smaller portion of the TCE plume”?

RESPONSE: A “break” occurs in the upper aquifer TCE contaminant plume beneath Washington Ave in Tillicum. When the 5 ug/l contour is plotted, two distinct plumes are depicted, one being the main TCE plume extending from Washington Ave in Tillicum back to the EGDY source area, the other beginning just north of Washington Ave and continuing to American Lake. TCE is present between these two segments of the TCE plume, but in concentrations below 5 ug/l. This information suggests a “break” in the plume has occurred. The plume separation at Tillicum is not correctly depicted on Attachment 2 (“Upper Aquifer TCE Plume Map”) and will be incorporated into the revised figure (along with new March 2002 data). The above assertion is based on (1) historical data from 1987-1988 at Tillicum monitoring wells T-01 through T-08, T-11a/b, T-12a/b, and T-13a/b, (2) LOG RAM data (1995-2001) from T-04, T-12b, and T-13b,

and (3) LOG RAM data from the latest round of sampling (March 2002 at wells T-04, T-06, T-09, T-11b, T-12b, and T-13b).

11. Refer to pg. 5, 3<sup>rd</sup> para. - I suggest that the 3<sup>rd</sup> sentence should be restated something like: "The remedy in the ROD was designed to remediate VOCs only."

RESPONSE: The third sentence has been restated as suggested.

12. Refer to pg. 5, 4<sup>th</sup> para. - Because of the potential concern over the indoor air pathway, the residential areas identified in this section should be identified on a map to depict the proximity of the housing areas to the Upper Aquifer plume.

RESPONSE: All residential areas identified within the text of the report will be depicted on the plume map attachments to the report.

13. Refer to pg. 6, 1<sup>st</sup> & 2<sup>nd</sup> full para. - The addition of a map identifying the location of the nearest Upper & Lower Aquifer wells in relation to the plumes would be a beneficial addition (such as the map included in the risk assessment addendum). A short discussion regarding any sampling of these wells should be included in this section.

RESPONSE: Because there is only one water supply well within the extents of the TCE plumes in operation (Beachcomber Well, Tillicum, in upper aquifer) and because recent testing showed no TCE or other VOCs present at this well, a separate map has not been added to the report. Instead, a brief discussion of the Beachcomber Well sampling event is included in the text, and reference is made to Figure 2-6 in the Risk Assessment Addendum in which all identified upper and lower aquifer water supply wells are shown. Additionally, the Beachcomber Well location has been added to the upper aquifer TCE plume map.

14. Refer to pg. 6 & 7 - The Remedial Action Objectives listed here are more like components of the remedy. The only Remedial Action Goal or Objective specifically stated in the ROD is: "The goal of this remedial action is to restore groundwater to its beneficial use, which is at this site, a drinking water source. Remediation levels will be attained throughout the contaminated plume."

RESPONSE: This section has been revised as per the comment above. The remedial action objective, or goal, has been revised to state: "the goal of this remedial action is to restore groundwater to its beneficial use, which is, at this site, a drinking water source." For informational purposes, the components of the remedy remain in this section but they are stated as such; components of the remedy and not RAOs or goals.

15. Refer to pg. 7, Remedial Action Implementation - One component included in the ROD for the pump and treat system was to inject treated water upgradient of the source (EGDY) to aid in flushing the source of contaminants. This should be mentioned in the Review as well as any observations regarding its success.

RESPONSE: A discussion regarding the infiltration of treated water from the treatment systems has been included in the Remedial Action Implementation section of the report.

16. Refer to pg. 8, 1<sup>st</sup> para. - The 2<sup>nd</sup>-to-last sentence starts with “Based on these findings...”. It is not clear what findings are being referred to. If the findings being referred to is the concern of pulling down additional contamination from the Upper Aquifer, this sentence is not accurate. The ESD did not eliminate the potential use of pump & treat on the Lower Aquifer. The ESD delayed a decision on choosing a remediation remedy for the Lower Aquifer until additional information on the Lower Aquifer problem is obtained.

RESPONSE: Comment is noted and correction has been made to the paragraph in question to indicate ESD delayed a decision on remedy selection for lower aquifer and did not altogether eliminate pump-and-treat option for lower aquifer.

17. Refer to pg. 8 - Please revise the phrase after “where the 1990 ROD had specified:” to read as follows: “...extending the groundwater extraction and treatment in on-site treatment facilities to the lower aquifer if it is found to be contaminated.”

RESPONSE: Subject phrase has been revised as suggested.

18. Refer to Remedial Action Implementation on pgs. 7 through 10 - This would be a good place to briefly discuss the tests involving innovative technologies conducted over the past several years and other tests that are scheduled to take place over the next year or two.

RESPONSE: Recent work related to innovative technologies at the EGDY/Logistics Center will be briefly discussed in this section

19. Refer to pg. 9, 1<sup>st</sup> para. - This section should mention recommendations made (if any) in the evaluation reports and what was done with those recommendations.

RESPONSE: Recommendations made and actions taken from the Two Year Performance Evaluation Report are discussed under Section V. – “Progress Since the Last Review/Additional Progress.”

20. Refer to pg. 9, 2<sup>nd</sup> para. - Please include a sentence briefly describing how the estimate of 46,000 pounds of TCE removed was calculated.

RESPONSE: The estimate of 46,000 pounds of TCE removed from the EGDY in drums and associated impacted soil was based on averaging TCE concentrations from each rolloff bin or drum, multiplying by mass of waste removed from that rolloff bin or drum, and totaling all bins and drums to obtain TCE mass removed. A more detailed explanation, along with supporting documentation, is included in the Final Trenching/Drum Removal Report. The explanation provided above has also been added to the 5-Year Review Report text.

21. Refer to pg. 10, 1<sup>st</sup> partial para. - Please include a map identifying the NAPL areas.

RESPONSE: An attachment has been included in the report to show the locations of the three defined NAPL areas at EGDY.

22. Refer to pg. 12, top of page - It is difficult to compare O&M costs estimated in the Feasibility Study to actual costs with the information provided. This section states that the estimated O&M costs did not include electrical costs nor groundwater monitoring costs; however, it does not state whether such activities were or were not included in the actual costs provided. The section states that the Feasibility Study costs are in 1989 dollars, but does not state what year dollars the actual costs are in.

RESPONSE: Actual costs provided in the 5-Year Review also did not include electricity, groundwater monitoring, or system compliance monitoring costs. Actual costs were in current year dollars (i.e., 1997 costs were in 1997 dollars, 1998 costs in 1998 dollars, etc.) and hence if inflation were factored into the Feasibility Study costs estimated to adjust from 1989 dollars (\$135,000 per year), the O&M actual versus estimated costs would be more in line with one another. Clarification has been added to the report.

23. Refer to pg. 13, Table 4 - The table mentions institutional controls to prevent use of contaminated shallow aquifer groundwater. In general, institutional controls deserve more attention in the Five-Year Review. The Five-Year Review should specifically describe what these controls consists of and how they have worked over the last 5 years (for both on-base and off-base uses). The Review (not necessarily in Table 4) should also describe the institutional controls that prevent use of contaminated water in the Lower Aquifer and that prevent exposure to soil contamination at the East Gate Disposal Yard, and evaluate how effective these controls have been over the last 5 years. The evaluation should mention any breakdowns or failure of the institutional controls, why the breakdowns took place, and what was done to improve the ICs.

Table 4 states that Ft. Lewis property is not to be transferred from DOD. What assurances does Fort Lewis have that its property will never be transferred from DOD?

RESPONSE: The following text has been added to the Five-Year Review Report under Section V, Progress Since the Last Review with regard to institutional controls:

“Planning for Fort Lewis land use controls was strengthened in 1998 with the development of a Master Plan for base land utilization. This planning document is the basis for all current and future construction programs, use of open space, and training lands. The Master Plan allocates training lands to be managed by Fort Lewis Range Control. Any additions or changes to training areas must be coordinated through Range Control and the Master Plan.

Engineering Controls at Landfill 2 (EGDY) to prevent exposure to contaminated soil during the past five years consisted of excluding the Landfill from the public by a cantonment fence and locked gates. Signage was posted stating that the site (1) was a superfund site, (2) was under remediation, and (3) only authorized personnel were allowed entry. These controls excluded residents, runners, off road vehicles, and other

unauthorized entry. The Master Plan was amended with the addition of Landfill 2 and a base road moved to prevent entry into Landfill 2.

Due to base improvements related to the War on Terror, a fence was incorrectly erected in the wrong location at Landfill 2. This error was corrected the same day and the fence relocated to further prevent entry by residents into the landfill area. Due to a generalized location for a digging permit, this construction occurred and environmental personnel did not have specific information to not authorize the construction. Future digging permits require specific proposed locations to ensure construction in authorized areas as delineated by the Master Plan.

Fort Lewis has ensured the potability of drinking water on the installation by routinely monitoring drinking water wells for contamination and shutting down wells that have the potential for TCE contamination.”

Fort Lewis has been classified as an “enduring installation,” meaning that it is among the three primary Army installations that, if all other bases closed, would remain open.

24. Refer to pg. 14, Five-Year Review Process - The Review should also address discharge criteria for the treatment plants and whether or not the requirements have been attained.

RESPONSE: All discharge criteria from both the I-5 and EGDY groundwater treatment plants have been met for the period of interest for this five-year review (1997-2002). A discussion of discharge criteria and system performance has been included under Section VI (Five-Year Review Process, Data Review).

25. Refer to pg. 15, Data Review, 2<sup>nd</sup> para. - The Review indicates that slight increasing trends are evident at wells LC-53, LC-64A, LC-116B, LC-132, and LC-136A. I disagree that these increases are slight for wells LC-64A, LC-132, and LC-136A. The increase from 1995 to present for LC-64A is from 430 ppb to 28,000 ppb, for LC-132 from 25 ppb to 110 ppb, and for LC-136A from 24,000 ppb to 220,000 ppb. I agree with the Review’s observation that the increase for LC-64A coincides with the start of removal activities at the East Gate Disposal Yard. The increase for the other two wells appear to be relatively steady increases over time.

RESPONSE: We are in agreement that the increasing trends are more than slight for wells LC-64a and LC-136a, and text within the report has been revised accordingly. Relative to the trends in these wells, the increasing trend at LC-132 is slight. We are also in agreement that the trends at wells LC-132 and LC-136a appear to show relatively steady increases over time.

26. Refer to pg. 16, 2<sup>nd</sup> para. - I don’t understand the 3<sup>rd</sup> sentence which appears to indicate that TCE concentrations in extraction wells are expected to be higher than monitoring wells.

RESPONSE: Areas of higher TCE concentrations were preferentially selected as extraction well locations in order to pump-and-treat in the most effective manner.

Monitoring well locations, conversely, are often selected based on their goal as either a plume perimeter characterization well, a central-plume characterization well, background well, or sentinel well. TCE concentrations of all types of monitoring wells listed except central-plume characterization wells are expected to be relatively low or non-detect. An attempt has been made to clarify the sentence you refer to.

27. Refer to pg. 17 & 18, Question A - I don't agree with the conclusion that the remedy is functioning as intended by the ROD, as modified by the ESD. The remedy identified by the ROD was not functioning as intended and therefore necessitated the ESD. The remedy identified by the ESD is not yet in place and therefore is not functioning.

I also don't agree with the statement that the groundwater treatment system has achieved the remedial action project goals of reducing exposure to contaminated groundwater and to remediate the groundwater to levels that are protective of human health and the environment. The pump and treat systems aren't reducing exposure to contaminated groundwater; institutional controls are doing that. The pump and treat system is not remediating groundwater to cleanup standards within a reasonable time frame in the Upper Aquifer and is doing no remediating of the Lower Aquifer.

The Review indicates that the ROD included an assumption that the two pump & treat systems would remove 5,000 g.p.m. and 2,000 g.p.m. Do you know why the systems weren't designed to meet these levels? If the systems were designed to these levels, would you expect groundwater cleanup levels to be achieved within 30 years?

The 3<sup>rd</sup> paragraph in the section states that TCE levels have remained stable in place and time. Please add a caveat to this statement something like: "...although some wells have shown steady increases in TCE concentrations."

Considering the lower aquifer wells used by MAMC, is the first sentence in the 4<sup>th</sup> paragraph accurate? This paragraph should briefly mention the errant fence constructed across the EGDY last year.

RESPONSE: The conclusion has been revised to indicate that the remedy is proceeding (but not yet functioning) as intended by the ROD and subsequent ESD, since the source removal contained within the ESD is not yet fully in place.

The groundwater treatment system is remediating groundwater to cleanup standards (in the upper aquifer) but it is apparent that complete cleanup would not be achieved within 30 years. Also, the GTS is not helping to remediate the lower aquifer (other than preventing some amount of contamination from reaching the lower aquifer through EGDY extraction and treatment). You are correct in that it is the institutional controls that are reducing exposure to contaminated groundwater, not the pump-and-treat system itself. Text has been revised accordingly.

To clarify the 5,000/2,000 gpm treatment system issue, these values were estimates within the feasibility study based on preliminary modeling to capture contamination from leaving Fort Lewis near I-5 and to contain contamination at EGDY. The GTS design analysis included much more detailed modeling and data analysis (including multiple pumping test analyses) and concluded contamination could be captured at I-5 and contained at EGDY with total extraction rates considerably lower than 5,000/2,000 gpm. Because the Design Analysis was conducted after the ROD was issued, the ROD referenced the estimated rates from the feasibility study. Even with the

extraction and treatment systems operating at their designed capacities, however, the groundwater cleanup levels would still not be reached within 30 years of system start-up because substantive source removal did not occur at the time of system start-up.

The third paragraph has been changed to include the following: “While a few wells have experienced steady increases in TCE concentrations over time, and others have experienced decreases over time, on the whole, TCE concentrations have remained stable in time and space, indicating that the TCE plume is not appreciably changing. The disturbance of subsurface soils and NAPL source due to the drum removal and any future thermal treatment actions is likely to temporarily alter the stability of the plume beneath the EGDY, however, this change should be apparent in the future remedial action monitoring network data.”

First sentence of fourth paragraph is still considered accurate since MAMC lower aquifer wells are outside the 5 ug/l contour based on March 2002 sample data. MAMC wells will continue to be monitored and appropriate actions taken if TCE concentrations exceed 5 ug/l. The tank trail fencing that was mistakenly placed through the EGDY was taken down and rerouted around the EGDY, and tied into the existing EGDY fence line north of the source area contamination along East Lincoln Drive. The mistake was corrected by the Army in a timely manner. A sentence has been added regarding the errant fence.

28. Refer to pgs. 18, 19, & 20, Question B - The 3<sup>rd</sup> paragraph states that studies concluded that if a pump-and-treat system was installed in the Lower Aquifer, it would likely result in an expansion of the Lower Aquifer plume by drawing in more contamination from the Upper Aquifer. I don’t believe that this was a conclusion reached by these studies; it would be more appropriate to refer to this issue as a concern or a possibility. Also, there are ways that such a system could be designed to eliminate this concern or reduce the possibility of it occurring.

The ESD did not eliminate the potential use of pump & treat for the Lower Aquifer. The ESD implied that we did not know enough about the Lower Aquifer problem to commit to using pump & treat. The ESD indicated that we should concentrate on remediating the sources of contamination to the Lower Aquifer (by cleaning up the EGDY and trying innovative technologies to speed up remediation of the Upper Aquifer) while collecting additional information on the Lower Aquifer problem.

RESPONSE: The word “conclusion” has been removed from the paragraph and replaced with “concern.”

Comment regarding ESD contents is noted and text has been revised accordingly.

29. Refer to pgs. 20 & 21, Question C - Do we now believe that there is much more source material at EGDY than we did when the ROD was written?

The first paragraph should mention the potential risk from the indoor air pathway for the portion of the Madigan Housing Complex that is situated above the Upper Aquifer plume.

The 1<sup>st</sup> paragraph indicates contamination bulging to the southwest of the EGDY is ultimately captured by the I-5 pump & treat system. The statement should be clarified

to indicate that some of the contamination escapes to the Lower Aquifer prior to reaching the I-5 system.

This section refers to the surface water remediation goal as a statutory limit. Please replace “statutory limit” with “remediation goal”.

RESPONSE: No specific data regarding contaminant mass estimates could be found in the ROD; however, the assumptions contained in the ROD were likely the same as those of the Final Feasibility Study, in which the preferred GTS remedy that was implemented stated that groundwater beneath the Logistics Center would be remediated in 30 years, “except for a relatively small volume just downgradient of suspected source areas in the saturated zone.” This implies a relatively small volume of source area TCE NAPL for near-complete dissolution into groundwater to occur. The current understanding of the EGDY source area is that the dissolution of TCE NAPL into groundwater over the past 40-50 years to create the approximate 2-mile long by 1-mile wide plume has not appreciably diminished the TCE NAPL source mass, and a large mass still remains.

Based on the revised Risk Assessment Addendum calculations, a statement has been added to the first paragraph that states “The indoor air exposure pathway for TCE volatilization has been evaluated for residents of the Madigan Housing Area using the Johnson-Ettinger model and indoor air is not considered to pose a risk to this community.” Also it is noted that there are some uncertainties associated with the Johnson-Ettinger model and its sensitivity to various input parameters.

The first paragraph under Question C has been clarified to indicate some contamination does indeed elude the I-5 GTS by entering the lower aquifer prior to the I-5 well field.

“Surface water statutory limit” has been changed to “surface water remediation goal” as per comment recommendation.

30. Refer to pg. 21, Section VIII - Please add the Lower Aquifer to the list of Outstanding Issues.

RESPONSE: The lower aquifer plume status has been added to Table 16 (Outstanding Issues) and Table 17 (Recommendations and Follow-up Actions) as well as to the Issues section of the 5-Year Review Summary Form at the beginning of the report.

31. Refer to pgs. 21 & 22, Section IX - Regarding the issue of the Lower Aquifer, I recommend including the following actions: conduct cleanup activities at EGDY ASAP; continue to evaluate innovative technologies for speeding the cleanup of the Upper Aquifer; and continue to evaluate the Lower Aquifer problem.

Why is the recommendation for optimizing the entire GTS delayed until the completion of thermal treatment at EGDY? Regarding the East Gate system, I understand the need to wait; but why does the I-5 optimizing also depend on the completion of heat treatment?

RESPONSE: The recommendations and follow-up actions you suggest have been included under the “lower aquifer” issue in Table 17 of Section IX.

Minor adjustments to the I-5 system could be made prior to the completion of EGDY thermal treatment. For example, well rehabilitation to increase the specific capacity of a well, bringing a new extraction well on line to re-establish 5 ug/l TCE capture, or shutting an existing well down that is outside the 5 ug/l contour are examples of actions that could be taken. However, large-scale optimization (substantial alteration or reconfiguration of I-5 system) would not be prudent at this time.

32. Refer to pg. 22, Table 17 - We would like to see a recommendation that states something like: "The EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities will be fully implemented by Fort Lewis prior to Dec. 31, 2002."

RESPONSE: Fort Lewis will continue to research, discuss and employ the guidance provided by Office of the Under Secretary of Defense memorandum, "Army Implementation of Defense Guidance on Land Use Control Agreements with Environmental Regulatory Agencies" dated 19 March 2001. In addition and concurrent with this guidance, Fort Lewis will study EPA guidance on, "The EPA Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities" and will, where feasible and concurrent with Department of Defense guidance, implement. The statements above have been incorporated into Section IX, Table 17 (Recommendations and Follow-up Actions). Full implementation prior to 31 December 2002 is unreasonable. Because it will take some time to implement, a milestone date of January 2004 has been established and included in Table 17.

33. Refer to pg. 22, Section X - I agree that the remedy continues to be protective; but think that the 1<sup>st</sup> sentence in this paragraph should be re-written to more accurately explain why. The remedy continues to be protective by keeping the plume in check through the GTS, by prohibiting the use of groundwater within the plume through institutional controls, and monitoring of the Lower Aquifer plume.

RESPONSE: The first sentence has been rewritten to include protectiveness due to the combination of all three mechanisms you refer to (GTS, institutional controls, and lower aquifer plume monitoring).

34. Refer to pg. 23 - The reference to a type 1A review should be deleted as these categories of reviews are no longer used.

Regarding the 2<sup>nd</sup> sentence, the second qualifier can be deleted. All soil and groundwater at the site does not have to be reduced below levels that allow unlimited use and unrestricted exposure prior to achieving the status of Construction Completion.

RESPONSE: The reference to "Type 1A" review has been deleted.

The second qualifier pertaining to soil and groundwater contaminant levels has been removed from Section XI (Next Review).

35. We would like to see a map that identifies all wells listed on Table 5.

RESPONSE: All wells listed on Table 5 (all wells that have been a part of the LOG RAM sampling) have now been included on either Attachment 2 (for upper aquifer wells) or Attachment 3 (for lower aquifer wells).

### **Comments by Marcia Knadle:**

#### General Comments:

These comments are based on my review of the Fort Lewis Logistics Center Draft Five-Year Review Report. Overall, the report is well-organized and clearly presented, although I think the inclusion of a hydrogeologic cross-section would be helpful and some of the other figures could be improved.

RESPONSE: A 5-Year Review is primarily just that, a review exercise of past data and reporting, with minimal new data interpretation such as would be required to update cross-sections from previous reports. Draft cross-sections of the EGDY and Logistics Center are presented in the Draft EGDY Phase II RI Field Investigation Report. They have not been included in the 5-Year Review because they are still in draft form.

#### Specific Comments:

##### 1. Page viii –

Additional issues should be included: 1) containment/capture/treatment of contaminated water in the lower portion of the upper aquifer (near and down gradient of the I-5 treatment system), 2) containment (and capture/treatment if needed) of contaminated water in the lower aquifer, and 3) current and short-term protectiveness of the remedy as regards the GW-to-indoor-air exposure route. Recommendations and follow-up actions should include additional characterization and monitoring in the lower portion of the upper aquifer and the lower aquifer, and indoor air and/or soil gas monitoring in/near existing potential exposure points to confirm the protectiveness suggested by modeling results. I think it's difficult to say that the remedy is protective when there is no effective control on the flow of TCE to the lower aquifer (now or any time soon) nor any demonstration of control (through natural attenuation) on expansion of the lower aquifer plume. Johnson-Ettinger indoor air model results are close enough to 10 E-04 risk levels to need field confirmation at existing receptor locations, given the uncertainties inherent in both the inputs and the model itself. Moreover, it should be noted that the modeled results exceed the acceptable risk levels established in MTCA.

RESPONSE: (1) Based on the available data, it is unclear to what extent contamination exists in the lower portion of the upper aquifer within the immediate vicinity of the I-5 treatment system. This is demonstrated by two Lower Vashon monitoring wells LC-111B and LC-122B along the line of extraction wells showing TCE concentrations below 5 ug/l and one Lower Vashon well LC-116B exhibiting low-level TCE concentrations above 5 ug/l only in the last year and a half. The only well that is well-seated into the

Lower Vashon down gradient of the I-5 extraction well line that experiences TCE in excess of 5 ug/l is LC-128 (20-30 ug/l). It appears that at the I-5 extraction system TCE is not appreciably moving under the system through the Lower Vashon due to the combined effects of pumping from the Upper Vashon and favorable geohydrologic conditions (preferential pathway through Upper and not Lower Vashon). The Lower Vashon in the vicinity of the I-5 system will continue to be monitored. (2) The lower aquifer has been added to the Issues section of the Five-Year Review Summary Form. See also response to Bob Kievit's Comment #30. (3) GW-to-indoor-air exposure pathway has been briefly discussed in Section VII (Technical Assessment, Question C) . Discussion is based on results of Johnson-Ettinger indoor air model. Recommendations and follow-up actions now include lower aquifer; they do not include the lower portion of upper aquifer because we believe current level of characterization and monitoring is adequate due to reason stated under (1) above. Indoor air monitoring in/near existing potential exposure points is not warranted based on modeled results; however, because the Army wishes to be proactive in ensuring the health of its residents, an indoor air sampling program at the Madigan Housing Area in some of the units closest to EGDY is being discussed internally at this time. The 5-Year Review Report will not directly address indoor air monitoring because we feel it is not the appropriate venue to discuss or initiate new sampling efforts and also since the air sampling is now only in the planning stage. The remedy can be considered protective in the short-term for the reasons stated in Bob Kievit's Comment #33.

## 2. Page 5, 2<sup>nd</sup> ¶ –

Line 2 – the highest levels found in the lower aquifer have been as high as 180 :g/L (LC-69D, 5/11/94). Line 11 – as shown on Attachment 3 (and supported by ground water contours on Attachment 5), the lower aquifer plume extends both to the northwest and to the west of the window, not south and west. The USGS' preliminary lower aquifer investigation results would have to be presented to ; the down gradient extent is not completely known, but is at least 4,800 feet. The new lower aquifer wells that have just been sampled may clarify this. Last sentence – there's now a complete set of data from March 2002 which should be used for this report.

RESPONSE: Highest TCE level in lower aquifer has been changed from 160 to 180 ug/l. Lower aquifer plume direction from window has been revised from "south and west" to "northwest and west." The down gradient extent is to be better defined by the new lower aquifer wells installed earlier this spring. March 2002 quarterly sample data is available and has been used for the revised plume maps and water level contour maps included in the final 5-Year review report.

## 3. Page 6, 1<sup>st</sup> complete ¶ –

There is one water supply well within the presumed boundaries of the upper aquifer plume: the Beachcomber Complex Water System, which has recently been tested and was non-detect for TCE (and everything else).

RESPONSE: The Beachcomber Complex well has been included in the discussion within Section III (Background, Land Use/Groundwater Resource Use).

4. Page 6, 2<sup>nd</sup> ¶ –

It should be noted that the base recently shut down a base water supply well in the lower aquifer near the plume when it started to show detections of TCE. There was some speculation that operating that well had pulled the plume in that direction.

RESPONSE: The shut-down of Fort Lewis water supply well PS Well 13 has been added to the report.

5. Page 7, RA Implementation, 2<sup>nd</sup> ¶, last sentence –

It should be noted that the I-5 extraction system does not intercept the entire depth of the upper aquifer plume, only the upper portion.

RESPONSE: Based on available information, the entire upper aquifer plume was apparently being intercepted by the line of I-5 extraction wells up until December 2000 (21<sup>st</sup> quarter), when TCE in excess of 5 ug/l was first detected at Lower Vashon well LC-116B located in the center of the I-5 well field line. TCE does not appear to be present in the lower portion of the upper aquifer (except at LC-116B) in the immediate vicinity of the EWs. See also response to Comment #1.

6. Page 8, 1<sup>st</sup> ¶; and page 19, last ¶ –

The cited lower aquifer studies didn't conclude that treating the lower aquifer might pull additional contaminated water from the upper aquifer. That speculation was raised later and cited to delay implementing pump and treat in the lower aquifer per the ROD until the hydrogeologic system was better understood.

RESPONSE: Comment is noted and revisions to the text have been made to correct the inaccuracy.

7. Page 10, 2<sup>nd</sup> ¶; page 19, 1<sup>st</sup> ¶; page 20, Question C, 1<sup>st</sup> ¶; and page 21, 2<sup>nd</sup> ¶ and Table 16 –

Modeled risks due to indoor inhalation of vapors from the upper aquifer for both residents and office workers were between 10 E-04 and 10 E-05, which raises a question: are we comfortable enough with **modeled** results not to pursue sampling actual TCE exposure to current receptors? Moreover, the exposure point concentrations used in the model inputs don't really reflect the fact that TCE levels in groundwater have generally risen over time in both the portion of the plume heading toward the residential area and in the area modeled for office workers. What if the levels continue to rise?

RESPONSE: More wells have been installed and more data has become available in the areas to the northwest and southwest of EGDY, thereby increasing our level of characterization of the plume over time in the areas in question. Wells LC-51 and LC-53 (about 1,100 and 2,000 ft from nearest Madigan Housing, respectively) have exhibited slight increases in TCE concentrations since 1995. It is conceded that TCE levels may temporarily rise in the future due to thermal treatment of the EGDY source area and hence continued long-term monitoring in these areas will be of increased importance. A proposed TCE concentration threshold will be developed and included in the Risk Assessment Addendum such that, if TCE concentrations approach the threshold, indoor-air sampling may be warranted. See also response to Comment #1.

8. Page 11, 3<sup>rd</sup> ¶, next-to-last sentence; and Page 14, 2<sup>nd</sup> ¶, 2<sup>nd</sup> sentence –

This may be a quibble, but reducing sampling frequency from quarterly to annually (a 75% reduction) in most wells is not a “slightly” reduced frequency to my mind.

RESPONSE: Even after the first go-around in optimization, there are still more wells being sampled quarterly than annually. Nonetheless, “slightly” has been removed from referenced sentence.

9. Page 11, last ¶, first 2 sentences –

LX-16 and RW-01 were shut down so Battelle could conduct the ISRM Proof of Principle test, not the RABITT treatability test.

RESPONSE: Text has been changed to reflect the shut-down of wells LX-16 and RW-1 by Fort Lewis so Battelle could conduct the ISRM Proof of Principal test.

10. Page 12, 2<sup>nd</sup> ¶, 3<sup>rd</sup> sentence; and page 21, Table 16 –

Besides the upper aquifer plume possibly going around the southwestern end of the I-5 extraction system, the lower portion of the upper aquifer plume is not being captured at all.

RESPONSE: See response to Comments #1 & #5.

11. Page 12, Table 4 –

The 1997 5-year review called for more than completing an ESD for the lower aquifer. It also specified “to report on the investigation of contamination in the lower aquifer, to explain the reasoning for not proceeding with the implementation of an extraction and treatment system at this time and to describe an alternative remedy.” The lower aquifer is still being investigated, and no alternative remedy specifically for the lower aquifer has been described yet.

RESPONSE: Under “Recommendations” in the first five-year review, it states, “Fort Lewis will proceed with the completion of the draft ESD for the Lower Aquifer to report on the investigation of contamination in the lower aquifer, to explain the reasoning for not proceeding with the implementation of an extraction and treatment system at this time and to describe an alternative remedy.” My understanding of this statement is that the ESD was to address these three items (lower aquifer contamination investigation, reasoning for not proceeding with GTS in lower aquifer, and description of lower aquifer alternate remedy), not the first five-year review. Items in question have been added to Recommendations and Follow-up Actions of “ESD for Lower Aquifer” in Table 4.

12. Page 14, 3<sup>rd</sup> ¶, last sentence –

The three conventional lower aquifer monitoring wells installed since 1997 (LC-75, LC-76, and LC-77) should also be mentioned here.

RESPONSE: The installation of three new lower aquifer wells in December 1999 (LC-75, LC-76, and LC-77) has been added to the text under Section V (Progress Since the Last Review, Additional Progress).

13. Page 16, 1<sup>st</sup> full sentence –

If the rise in contaminant levels seen in LC-136A since system start up is considered “slight,” what would a “significant” rise look like?

RESPONSE: Text has been revised accordingly. See response to Bob Kievit’s Comment #25.

14. Page 16, 3<sup>rd</sup> full ¶, next-to-last sentence; and App. 1 –

Besides LC-66D, it was also concluded that TCE levels in LC-40D, LC-72D, and LC-73D were biased low during that same period. That should also be noted on the TCE concentration graphs for those wells.

RESPONSE: As documented in the Fifth Annual Monitoring Report and the Draft RAM Network Optimization Report, TCE concentrations in LC-40D, LC-66D, LC-72D, and LC-73D were all biased low during the period between September 1999 and December 2000. Text and Appendix 1 (Graphical Summaries of TCE Concentrations Over Time) have been revised to reflect this information.

15. Page 17, 2<sup>nd</sup> ¶; and page 18, 3<sup>rd</sup> ¶ –

The RAM network optimization plan called for installing several new upper aquifer wells to fill spatial gaps in the network, as well as adding several existing wells to the sampling program. The existing wells were added in Dec. 2001, but the new wells haven’t been installed to my knowledge. I recall that they were tentatively scheduled for installation after the new multilevel lower aquifer wells were installed. That’s finished,

so maybe they're happening now.

RESPONSE: The six proposed upper aquifer wells to fill in data gaps with the RAM network are still planned and will be installed as soon as funding and contracting issues are taken care of. This will occur sometime in FY2003.

16. Page 18, 1<sup>st</sup> ¶ –

The existing treatment systems are not remediating the lower aquifer, and they're not remediating the lower portion of the upper aquifer in the downgradient portion of the plume.

RESPONSE: We are in agreement that no lower aquifer water is currently being treated and that no lower-upper aquifer water is being treated down gradient (at I-5); however, until very recently all three lower-upper aquifer wells at the I-5 well field line (LC-111B, LC-116B, and LC-122B) had VOC concentrations below MCLs, including TCE. It is true that one lower-upper aquifer well down gradient of the I-5 extraction well line (LC-128) has consistently contained TCE above the MCL (eg., 20 ug/l in March 2002). Also of interest is the fact that LC-116B (located at the midpoint of the I-5 well line) has been above the MCL for TCE the past 6 quarters (11 ug/l in March 2002). Prior to that, it was below MCLs for all VOCs. The apparent rise in concentration at LC-116b will need to be monitored closely.

17. Page 18, 4<sup>th</sup> ¶ –

The recent shut-down of the Ft. Lewis Water Supply Well that began showing detections of TCE should be discussed here. It demonstrates that the base is testing vulnerable wells on the base and paying attention to the results to prevent on-base exposure.

RESPONSE: The recent shut-down of PS Well 13 based on TCE detection and its relation to institutional controls will be briefly discussed.

18. Page 22, Table 17 –

This table should include 3 additional issues/recommendations: 1) confirmation sampling for indoor air exposures, 2) remediation of the lower portion of the upper aquifer, and 3) remediation of lower aquifer.

RESPONSE: Lower aquifer recommendations have been added to Table 17. It is currently envisioned that remediation consists of cutting off contamination at the source by removing/treating NAPL at the EGDY. See response to Comment #1 regarding indoor air sampling. Contamination in the down gradient, lower portion of the upper aquifer is, at least to some extent, pinched upward into the upper portion of the upper aquifer in the vicinity of the I-5 extraction well field (as seen by low or ND TCE values

at LC-111b and LC-122b). The recent rise in TCE concentrations above the MCL at LC-116b will continue to be monitored as part of the RAM program.

19. Page 22, Section X –

Short-term protectiveness issues: The Beachcomber Complex Water System well was just recently recognized as a possible exposure issue, suggesting that there needs to be a closer look at off-base areas that are known or inferred from monitoring well data to exceed the MCL, both to confirm that existing drinking water wells have been sampled and to confirm that adequate ICs exist. Also, the areas with the greatest modeled indoor air exposure risk should be sampled (indoor air and/or nearby soil gas) to confirm that exposure levels are acceptable.

Long-term protectiveness issues: in addition to continued investigation of the lower aquifer and future optimization of both GTSS, evaluation of innovative technologies for cleaning up the upper aquifer should start to focus on reducing contaminant migration to the lower aquifer through remedial activities in (or immediately up gradient of) the “window” area. In a sense that’s a secondary source are that needs to be addressed before natural attenuation can begin to work in the lower aquifer.

RESPONSE: The Beachcomber Complex well was identified on Figure 2-6 in the Draft Risk Assessment Addendum as being within the historical limits of the upper aquifer TCE plume. Unfortunately, the implications of this finding were missed by the writers and reviewers of the report until recently. Based on the RA Addendum and new MAMC data, no other wells have been identified as being at risk for potential exposure to contaminants above MCLs due to the Logistics Center plume. The Beachcomber well has been added to discussion in Section III (Background, Land Use/Groundwater Resource Use). Regarding indoor air sampling, please see response to Comment #1.

I wouldn’t necessarily call the “window” area a secondary source but it is agreed that reduction of contaminant migration through the window from the EGDY upper aquifer should be the focus for long-term protectiveness of the lower aquifer. Precisely where and how the contaminant reduction needs to be actively pursued is debatable.

20. Attachment 2 –

The March 2002 data should be used to generate this map, which would include data from wells added with the RAM optimization and would show a larger TCE bulge to the SW of the EGDY. Also, on all of the upper aquifer maps it’s very difficult to distinguish the well labels and posted data, especially where wells are close together. Inset maps would be helpful.

RESPONSE: September 2001 data has been replaced with March 2002 data and the plume maps have been revised accordingly. An attempt has been made to make well labels and posted TCE values more readable while still keeping the map size at 11x17-inches. An inset of EGDY TCE has been included as Attachment 3.

21. Attachment 3 –

Again, the March 2002 data should be used.

RESPONSE: The March 2002 data is used in the revised report.

22. Attachment 5 –

This figure doesn't take into account the USGS water level data, which suggests a "ridge" of water from American Lake acting as a flow barrier. In part, that's because this map doesn't include LC-166D. As a result, the downgradient contours are very misleading, suggesting that the lower aquifer discharges to American Lake instead of the other way around.

RESPONSE: Former Attachment 5 (now Attachment 6) has been revised to include LC-166d. The potentiometric surface more accurately depicts American Lake as a barrier to lower aquifer flow underneath the lake. This is illustrated on the map by the contours being deflected to the southwest of the center of the lake.

23. Appendix 1 –

It should be noted that the Sept. 2000 data point for LC-128 is a possible outlier (high). Also, see comment 14.

RESPONSE: The September 2000 data point for LC-128 has been identified as a possible outlier on the graph in Appendix A.

USGS COMMENTS ON THE LOGISTICS CENTER FIVE-YEAR REVIEW  
(Received 12 August 2002)

**Comments by Rick Dinicola:**

1. Page 11, O&M, second paragraph—The extraction wells LX-16 and RW-01 were shut down in order to conduct the In Situ Redox Manipulation proof-of-principle test rather than the RABITT treatability test.

RESPONSE: Text has been changed to reflect the shut-down of wells LX-16 and RW-1 by Fort Lewis so Battelle could conduct the ISRM Proof of Principal test.

2. Page 19, third paragraph—I don't recall the study that concluded that "if pump and treat were operated in the lower aquifer, it would likely result in expansion of the lower aquifer plume..." A reference for that statement should be provided if available, or the conclusion should be qualified in some way as anecdotal if it is just the current speculation.

RESPONSE: Wording in the third paragraph with regard to lower aquifer studies was inaccurate and has been revised.

3. Page 21-22, Issues, Recommendations, and Follow-up Actions: An additional outstanding issue is that the extent of TCE contamination  $> 5 \mu\text{g/L}$  in the lower aquifer is not known, and thus the stability of the plume in the lower aquifer is not known. That issue certainly affects future protectiveness, and may even be considered to affect current protectiveness. Successful sampling of the new lower aquifer wells and completion of the on-going lower aquifer investigation is the follow-up action by Ft. Lewis. The milestone date is 2003. Additional follow-up action may also need to include regular monitoring of wells MAMC-3 and 4 (if that is not already being done), and regular monitoring of PS-13 if that is still considered a viable water-supply well.

RESPONSE: It is recognized that complete characterization of TCE extent in lower aquifer is an outstanding issue, and that lower aquifer plume stability is unknown. As you point out, successful sampling of the new lower aquifer wells and completion of the on-going lower aquifer investigation, along with quarterly sampling of wells MAMC 3, MAMC 4, and PS-13 are follow-up actions being taken by Ft. Lewis. This issue is further addressed in Sections VIII (Issues) and IX (Recommendations).